University of Alberta

Gender Issues Related to Short-Term Recovery from Cardiac Surgery

by

Kathryn Margaret King ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosphy

Faculty of Nursing

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and research for acceptance, a thesis entitled *Gender Issues Related to Short-Term Recovery from Cardiac Surgery* submitted by Kathryn Margaret King in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

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Date: June 2, 1997

To my sons, Andrew and Kevin, who have grown up while I have been following my dreams.

To my parents for being wonderful grandparents, and having unfailing confidence in me. Without either, I know my dreams could not have come true.

ABSTRACT

If women's cardiac surgery outcomes are to be properly evaluated, issues related to gender must be understood. Recovery from cardiac surgery needs to be explored from a perspective that encompasses a `biopsychosocial' view of recovery, and attends to aspects of recovery that are pertinent and of concern to women. Thus, the effect of gender and age, and relationships between biophysical and psychosocial factors which might predict recovery from cardiac surgery were explored.

A correlational design was used to follow 120 Albertans (stratified by gender and age; <65years, ≥65years) through their third postoperative month. Patients were interviewed preoperatively, to obtain baseline data regarding symptoms, social roles, expectations, and self-reports of life quality, life satisfaction and plans for recovery (Gortner's Preoperative Interview Questionnaire); functional status (Duke Activity Status Index); health state (McMaster Health State Classification System); and social support (Shortened Social Support Scale). A medical record audit provided biophysical data related to medical history, complications, and length of stay. Telephone follow-up was attempted at one, two, and three months postoperatively to obtain self-reports of activities, and cardiac and surgical symptoms (Postoperative Self-Report of Recovery). At three months postoperatively, functional status, health state, and social support data were collected again.

By stratifying the sample and considering a biopsychosocial view of recovery (which attended to potential gender differences in recovery appraisal), findings suggest that the `accepted' belief that women do not fare as well when having cardiac surgery may not be well founded. Although women were more functionally impaired, had less social support, and reported lower life satisfaction than men preoperatively, they improved significantly over the postoperative period; there were gender-specific recovery trajectory differences which were more often related to social support and other psychosocial factors, than biophysical differences; and neither gender or age consistently predicted outcome.

When women present for cardiac surgery, they pose challenges and opportunities for nurses to use their skills and creativity in implementing strategies to maximize outcome. Issues of particular importance to consider include cardiac rehabilitation referral and attendance, social support, return to `work', and constituting a definition of women's recovery from cardiac surgery.

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CHAPTER 1

Introduction

Heart disease is a leading cause of death in women of all ages (American Heart Association, 1996; Heart and Stroke Foundation of Canada, 1996). Coronary artery disease (CAD) is not prevalent among younger women, but it becomes increasingly so among women following menopause as they lose the protective benefit which normal estrogen levels confer in development of ischemic heart disease (Heart and Stroke Foundation of Canada, 1996; Lerner & Kannel, 1986; MacPherson, 1992). Although younger men (35 to 44 years) experience morbidity from CAD more than six times the rate of women, the rate in women begins to increase after menopause and rises steadily until after the age of 75 years, when the rates of morbidity and mortality from CAD in men and women are approximately equal. Since 1950, the overall incidence of ischemic heart disease has declined in men, while it has increased in women (Eaker, Packard, & Thom, 1989).

Although CAD is clearly a health concern for women, it is not the only significant cardiac pathology that women develop. Women also develop valve disorder of both rheumatic and nonrheumatic etiology. When reviewing national statistics from the United States, Douglas (1989) concluded that the overall prevalence of valve disease is higher in women than men. Women more commonly develop rheumatic heart disease and are more likely to develop mitral or aortic valve stenosis even following apparently mild episodes of rheumatic fever. Though the incidence of rheumatic fever has been declining in North America since the 1940's (American Heart Association, 1996), it remains a very common malady in developing countries. As immigration to North America continues, the health care system will continue to see women presenting with cardiac sequelae of rheumatic fever. When considering

nonrheumatic valve disorders, mitral valve prolapse syndrome occurs more frequently in women (Devereux & Kramer-Fox, 1989; Douglas, 1989). Women also develop calcification of both the aortic and mitral valves at a younger age than men (Douglas, 1989).

As the incidence of CAD in women increases and the incidence of some valve disorders in women persists, women are seeking diagnosis and treatment for their cardiac problems with some requiring surgical intervention. There have been several investigations over the last decade or so which indicate that women are experiencing difficulties that men do not when seeking diagnosis of CAD and valve disease. There is growing evidence that women's cardiac symptoms are often considered psychological rather than physical in nature (Ayanian & Epstein, 1991; Bickell, et al., 1992; King & Jensen, 1994; Steingart, et al., 1991) leading to delay in diagnosis and treatment. The `usual' diagnostic procedures for assessing CAD are often not as accurate for women as for men. When having coronary artery bypass graft (CABG) surgery, the female gender also carries increased perioperative risk in both morbidity and mortality (Carey, Cukingnan, & Singer, 1995; Khan, Nessim, Gray, Czer, Chaux, & Matloff, 1990; Richardson & Cyrus, 1991), yet this has not been demonstrated in women who require valve surgery (Douglas, 1989; Lombard, 1994). Further, following CABG surgery, some studies indicate that women have a higher incidence of complication and more cardiac related symptoms postoperatively than their male counterparts (Gortner, Jaeger, Harr, & Hlatky, 1994; Low, 1993).

Most research focusing on the diagnosis and treatment of women with cardiac disease has been approached primarily from a biophysical perspective, rendering what Sharpe, Clarke, and Janz (1991) contend is "an even greater gap... in our understanding of the impact of heart disease (and heart surgery

for that matter) on the daily lives of... women" (p. 26). Yet, there is growing evidence that there are wide differences in the psychosocial experience of women and men who have cardiac disease and surgery (Hawthorne, 1994; Low, 1993; Murdaugh, 1986, 1990; Parchert & Creason, 1989; Penckofer & Holm, 1990; Varvaro, 1991). There is some evidence suggesting that women take a more passive role than men in their diagnosis and recovery process (Hawthorne, 1994). There is growing evidence that women use different cues than men in assessing their recovery from cardiac events and surgery (Hawthorne, 1993; Parchert & Creason, 1989; Penckofer & Holm, 1990; Varvaro, 1991). In addition, following cardiac surgery, women return quickly to their domestic responsibilities, and fewer have spouses to care for them (Hawthorne, 1993; King & Jensen, 1994; King & Gortner, 1996; Parchert & Creason, 1989; Penckofer & Holm, 1990; Wenger, Speroff, & Packard, 1993).

In a recent initiative of the National Institute of Heart, Lung, and Blood Diseases of the United States considering special issues in treating women with CAD, researchers concluded that a more broad perspective should be used which includes psychosocial aspects in all phases of the disease process (Blumenthal & Matthews, 1993). Wenger, Speroff, and Packard (1993) echo this concern regarding research on women having cardiac disease and surgery when they stated, "Since health care should enhance the quality as well as the quantity of life, psychosocial evaluation, including the assessment of the quality of life and of health related behaviour, should be included in all clinical evaluations" (p. 249) of women. These authors contend that when health care providers are considering treatment plans for female patients, they should also consider the other roles that women hold--mother, homemaker, employee, and possibly caretaker of husbands and/or elderly parents.

Statement of the Problem

The number of women who have cardiac disease and undergo cardiac surgery continues to rise in North America. Women also have increased morbidity in cardiovascular health with age, are generally more ill when presenting for cardiac surgery, and have poorer operative mortality than men. Therapeutic intervention such as cardiac surgery should decrease mortality and improve quality of life of women who have cardiac disease (Steingart, 1992). Yet, proper evaluation and understanding regarding outcomes of cardiac surgery on women are somewhat fragmented because research from biophysical and psychosocial perspectives have not been well integrated, and attempts by researchers to identify the salient facets of cardiac disease and surgical recovery in women have often been confounded by use of models based on predominantly male experiences. If outcomes of cardiac surgery interventions in women are to be properly evaluated, then issues related to gender must be understood. Recovery from cardiac surgery needs to be explored from a perspective that encompasses a broad `biopsychosocial' view of recovery, and attends to aspects of recovery that are pertinent to and of concern to women (Hawthorne, 1993; King & Jensen, 1994; King & Gortner, 1996; Low, 1993).

This research builds on a recent study by King and Gortner (1996) which focused on women's recovery from cardiac surgery. By following a cohort (N=27) of Northern California women, for three months postdischarge from their cardiac surgery, correlates of women's recovery from cardiac surgery were explored. In addition to data gathered using the protocol's measures, experiential narratives of these women were particularly enlightening. Based on findings from the California cohort, the interview guides were amended and a larger cohort of Alberta women and men were sought to as subjects for this research.

Specific Aims

The purpose of this study was to examine the effect of gender and age on short-term recovery from cardiac surgery. Relationships between biophysical and concomitant psychosocial factors which influence and predict short-term recovery from cardiac surgery were also explored.

Research Questions

Primary Question

What is the effect of gender and age on short-term recovery of patients following cardiac surgery?

Secondary Questions

What is the influence of gender and age on preoperative components of health in people having cardiac surgery?

What is the influence of preoperative components of health on recovery from cardiac surgery?

What is the influence of gender and age on intra-hospital procedures and events in people having cardiac surgery?

What is the influence of intra-hospital procedures and events on recovery from cardiac surgery?

What is the influence of gender and age on postdischarge activities of people having cardiac surgery?

What is the influence of postdischarge activities on recovery from cardiac surgery?

What do women and men identify as factors related to their recovery following cardiac surgery?

Hypothesis

The following hypothesis was tested when asking the primary research question: Age has a greater effect than gender on cardiac surgery recovery.

Definitions

Cardiac surgery: Researchers have concluded that patients who have had valve and CABG surgery recover similarly, and have thus used both valve and CABG surgical subjects when studying recovery from cardiac surgery (Gortner, Jaeger, Harr, & Hlatky, 1994; Gortner et al., 1988; Jenkins, Stanton, Savageau, Denglinger, & Klein, 1983; King & Jensen, 1994; Rankin, 1989, 1990). Thus, in this study cardiac surgery is defined as CABG, valve replacement, valve commissurotomy, valve annuloplasty, or any combination of CABG and valve surgery.

Women: Those people who are female in gender. Older or elder women were considered 65 years and older, while younger women were considered under the age of 65 years.

Men: Those people who are male in gender. Older or elder men were considered 65 years and older, while younger women were considered under the age of 65 years.

Recovery: Recovery is the process of convalescence (Hawthorne, 1993), adaptation and adjustment (Misra, Bain, & Mahmood, 1982; Radley & Green, 1985; Wilson-Barnett, 1981) following the survival from cardiac surgery. Recovery occurs as a multidimensional, and dynamic process in which the "target continually moves in keeping with the natural or clinical state of affairs" (Gortner & Jenkins, 1990, p. 472). Management of symptoms and performance of activities are renegotiated following surgical intervention with the aim of reaching some `target' or `goal'. Biophysical, intrapersonal and social aspects contribute to objective indicators and subjective perceptions of the degree to which this process has been `successful' or to which recovery takes place (Allen, 1990). Although this process can continue indefinitely for some, other researchers (Flynn & Frantz, 1987; Gortner, Gilliss, Shinn, et al.,

1988; King, & Parrinello, 1988; O'Connor, 1983; Tack & Gilliss, 1990) have reported the four, six, eight, and twelve week periods following discharge from hospital as milestones that include multifaceted aspects of recovery. For this study, recovery was assessed over a three month period following the operative procedure.

No gender-neutral measure of cardiac surgery recovery currently exists. Therefore, a number of measures and means reflecting a `biopsychosocial perspective' were used to assess components of cardiac surgery recovery. These included subject reports of return to activities, New York Heart Association (NYHA) status, surgical healing, prescribed medication use, health services use, as well as self perceptions of life satisfaction, life quality, perceived recovery and attaining treatment goals. Measures of health utility (McMaster Health State Classification System), functional activity (Duke Activity Status Index), social support (Shortened Social Support Scale), as well as reflective narratives, were used at three months postoperatively to enhance the assessment of recovery and to measure changes from preoperative states.

Physical Aspects of Recovery from Cardiac Surgery: These aspects of recovery are identified as symptoms of cardiac illness or indicators of body function following cardiac surgery. Not all indicators may be identified by the subjects as cardiac in nature or as postoperative sequelae. Thus, a variety of indicators of physical health and symptoms were considered; including measures of activity (including the Duke Activity Index), cardiac symptoms, as well as health resource and medication use.

Psychosocial Aspects of Recovery from Cardiac Surgery: These aspects of recovery are identified as facets of social functioning (social relationships), and intrapersonal functioning such as neuropsychological functioning (cognition, memory), emotional health (depression, optimism, having and attaining goals),

personal productivity (paid and unpaid work), and overall life satisfaction. A variety of measures, including the McMaster Health State Classification System and Shortened Social Support Scale, questions regarding return to activities, roles, and employment, as well as questions regarding life quality and life satisfaction were used to assess intrapersonal and social aspects of recovery.

Description of the Design

A prospective correlational design was used to follow cohorts of Alberta men and women following cardiac surgery through their third month postoperatively. As in an earlier study conducted with a cohort of Californian women (King & Gortner, 1996), interviews were conducted to obtain preoperative (baseline) measures of objective data and self-reports of life quality, life satisfaction, and plans for recovery. A medical record audit provided biophysical data related to medical history, diagnostic procedures and hospital stay. Telephone follow-up for all subjects was attempted at one, two, and three months postoperatively to obtain self-reports of activities related to recovery and narratives. Data collected at baseline and postoperative interviews were analyzed using ANOVA, correlations, and multiple regression procedures. Narratives describing experiences of recovery were analyzed for themes and reported.

CHAPTER 2

Literature Review

Much of the clinical knowledge about women and heart disease has been developed as a result of a few large scale studies. In particular, the Framingham Heart Study (Gordon, Kannel, Hjortland, & McNamara, 1978; Lerner & Kannel, 1986), a National Heart Lung and Blood Institute review of current research (Eaker, Packard, & Thom, 1989; Wenger, 1989), the Coronary Artery Surgery Study (CASS) registry (Eaker, Kronmal, Kennedy, & Davis, 1989), and a Cleveland Clinic Foundation study (Cosgrove, 1993), form a foundation of what is currently known. There are several other studies that certainly supplement this knowledge. In reviewing the literature, a much greater proportion of available research explores issues regarding CABG surgery than valve surgery, likely reflecting the proportion of individuals who undergo these two types of surgery. There are a number of similarities in the illness, diagnosis, treatment, and recovery phases of those who have CABG and valve surgery. The following review of the literature will include studies of both CABG and valve surgery, though disproportionately.

Severity of Illness

Risk Factors

Many of the risk factors for CAD for women are the same as that for men; family history, hypertension, high levels of LDL cholesterol, cigarette smoking, and sedentary life style. Women's use of oral contraceptives is also thought to be a risk factor for CAD; particularly in those women who smoke or are over the age of 40 years (Mann & Inman, 1976; Mann, Vessey, Thorogood, & Doll, 1976; Murdaugh, 1986, 1990; Oliver, 1970). The Framingham Study and the CASS also found that glucose intolerance and diabetes occurred more frequently in women and these were greater risk factors

for CAD in women than men. The CASS and Cleveland Study reported that women having CABG surgery had a significantly higher incidence of diabetes, hypertension, and elevated serum cholesterol levels, than their male counterparts. Interestingly, the CASS reported that women were more likely to be smokers at the time of their CABG surgery than men. The Framingham Study supported earlier findings that "menopause occurs slightly earlier in women who smoke cigarettes than in women who do not" (Gordon, et al., 1978, p. 160). The National Heart Lung and Blood Institute workshop concluded that current use of oral contraceptives and smoking increases the risk of CAD `synergistically'.

As women's age increases so too does the incidence of CAD (Heart and Stroke Foundation of Canada, 1996; Lerner & Kannel, 1986; Wenger, Speroff & Packard, 1993). The relationship between age and incidence does not necessarily exist when considering valve disorder. Mitral valve prolapse syndrome and rheumatic heart disease are more common in women and more likely found in women under the age of 70 years (Devereux & Kramer-Fox, 1989; Douglas, 1989; Russel & Blake, 1989). Although "women tend to develop calcification, in either valve, at a younger age than do men" (Douglas, 1989, p. 262), aortic valve disorder is more commonly associated with women over the age of 70 years and occurs as a result of calcification.

Younger women typically have less atherosclerotic disease than men. Whether women are experiencing stable angina, probable angina (atypical), or nonspecific chest pain (perhaps from valve disorder), once they reach the age of 70 years and are experiencing angina, the likelihood of CAD becomes the same as for men (Glazer & Hurst, 1987; Wenger, 1989). Women are, on average, ten years older than men when they experience the initial symptoms of angina, and twenty years older than men at the time of myocardial

infarction (Wenger, 1990). Though women generally have less CAD mortality than men, the `survival advantage' is lost once CAD becomes symptomatic; the mortality of women once their CAD becomes manifest is virtually the same or greater than that of men (Wenger, 1989). Wenger contends "with the progressive increase in the elderly population of most industrialized nations, coronary heart disease in women will likely become a more prevalent and serious problem" (p. 174).

Diagnosis of Cardiac Disease in Women

Although angina is the most common initial symptom of CAD in women (Glazer & Hurst, 1987; Wenger, 1989) its significance is often unappreciated. Unfortunately women and their health care providers may believe that their chest pain is a benign problem, since many women who have chest pain, in fact, do not have CAD (Hawthorne, 1993; Steingart, et al., 1991; Wenger, Speroff, & Packard, 1993). This conclusion is more legitimate when evaluating chest pain in younger women (Glazer & Hurst, 1987; Steingart et al., 1991). Further, the symptoms women have of CAD or valve disorder may not be typical of what is seen in men; particularly in the beginning stages of the disease process. Whether typical or atypical symptomatology, women's symptoms are more likely to be attributed as psychological in nature (Hawthorne, 1993; Rankin, 1989; Steingart, et al., 1991; Tobin, et al, 1987) and are not always acknowledged or investigated appropriately as potentially cardiac symptoms.

Although women are likely much more symptomatic and more functionally limited due to chest pain, fewer women than men undergo investigations for cardiac disease; specifically coronary arteriography and cardiac catheterization (Steingart, et al., 1991; Travis, Gressley, & Phillippi, 1993; Wenger, et al., 1993). Steingart et al., "found that men (who had CAD

symptoms) were twice as likely as women to undergo cardiac catheterization" (p. 228), while Travis, et al. found "that rates for diagnostic procedures were approximately 1.2 times higher for men than women" (p. 277). Once women's symptoms were recognized as valid through investigation, Steingart et al. found the disparity in referral for treatment became minimized. However, Travis et al. found that "rates for... (CABG surgery) were approximately two times higher for men (than for women)" (p. 277). To further complicate the diagnostic process for "women with chest pain, even those with typical angina (and who do have coronary arteriography, are more)... likely to have angiographically normal coronary arteries than are men with comparable symptoms" (Loop, et al., 1983, p. 387). Women also have a greater prevalence of non-CAD causes for chest pain, including mitral valve prolapse, rheumatic heart disease, and variant angina (as a result of coronary artery spasm) which may complicate the diagnostic process.

Obtaining an accurate diagnosis for CAD or valve disease in women is difficult because information about potential gender differences in diagnostic testing is limited (Bickell, et al., 1992; Khan, et al., 1990; Kindwall, 1989; Murdaugh, 1990; Murdaugh & O'Rourke, 1988; Tobin, et al., 1987; Wenger, 1990). "The use of noninvasive tests to diagnose coronary heart disease in women with chest pain syndromes is limited by their lesser predictive value as compared with testing of men" (Wenger, 1989, p. 183). The most common noninvasive tests for diagnosing CAD include exercise electrocardiography, exercise radionuclide ventriculography, and thallium scintigraphy. Glazer and Hurst (1987) recognized a longstanding concern that response to electrocardiography during exercise differs between men and women; only when women have multivessel disease (which is less common) does the true positive rate improve. Exercise radionuclide ventriculography is very insensitive

and has poor specificity for diagnosing CAD in women because the most commonly accepted abnormal response to exercise is the inability to increase the ejection fraction. Healthy women demonstrate a nonuniform ejection fraction response to exercise thus making exercise radionuclide ventriculography nonspecific at best (Glazer & Hurst, 1987; Murdaugh, 1990; Wenger, 1989). Thallium scintigraphy has been demonstrated to be superior to exercise electrocardiography in diagnosing CAD in women despite a problem with false positive results due to breast tissue interference (Glazer & Hurst, 1987; Melin, et al., 1985; Murdaugh, 1990).

Coronary angiography is considered one of the most accurate tests for women (Murdaugh, 1986; Wenger, 1989). However, referral for an invasive procedure such as coronary angiography clearly needs to be based on appropriate rationale. Diagnosis of cardiac disease in women becomes a matter of the practitioner having sufficient skill in communication to elicit a thorough and accurate history from the woman, and in making wise choices regarding the investigations that the woman experiencing symptoms ought to undergo (Glazer & Hurst, 1987).

Pharmacological Prevention and Treatment for Cardiac Disease

Findings from recent studies (prospective, retrospective, meta-analysis) indicate that in healthy postmenopausal women, estrogen administration may prevent or reduce CAD (Barrett-Connor, Wingard, & Criqui, 1989; Bush, Barrett-Connor, Cowan, et al., 1987; Matthews, Meilahn, Kuller, et al., 1989; Stampfer & Colditz, 1991; Stampfer, Colditz, Willett, et al., 1991). Most recently, Nabulsi, et al. (1993) reported that women who take estrogen supplements when postmenopausal may reduce their risk of CAD by 42 percent and women who take estrogen with progestin, may have an even greater benefit.

Although studies to date have indicated that administration of estrogen and estrogen in combination with progestin have positive effects on risk reduction of CHD, "the protective effect of estrogens on... morbidity and mortality (related to CHD) can only be directly demonstrated by long-term prospective controlled studies" (Sitruk-Ware, 1995, p. 62). To date, there are no published data derived from experimental (random selection and assignment) human studies involving HRT and CHD as the dependent variable. Studies are currently underway in the United States (Barrett-Connor & Bush, 1991; Bilezikian, 1994; Rosenberg, 1993), Britain and Scandinavia (Sitruk-Ware), however findings will likely be unavailable for a few years. Although many health care practitioners are currently recommending HRT for their women patients, more definitive findings from these studies will be welcomed.

Although little data are currently available regarding gender differences in effects of medications, Kindwall (1989) concluded that "most drugs used in the treatment of coronary heart disease appear equally effective in men and in women" (p. 198). This conclusion was drawn however, with the caveat that most drugs are tested on predominantly male subject groups (Kindwall, 1989; Murdaugh & O'Rourke, 1988). Some caution is in order regarding the use of beta blockers in women. Raynaud's phenomenon is more common in women; thus, non-selective beta blocking drugs may not be ideal choice. These drugs are also less optimal for women because many women with CAD also have diabetes (Kindwall, 1989; Murdaugh & O'Rourke, 1988). Since women generally have smaller coronary arteries, "fluctuations in coronary artery vasomotor tone may be of increased importance. Thus, nitrate drugs and calcium entry blocking agents that dilate large coronary arteries may be preferred therapies for angina syndromes in women" (Murdaugh & O'Rourke,

1988, p. 120).

Invasive Treatment for Coronary Artery Disease

The effect of gender on outcome of percutaneous transluminal coronary angioplasty (PTCA) is not unlike that for CABG surgery. Women who have PTCA are generally older than men, have a higher frequency and severity of angina, a higher incidence of unstable angina, and are more frequently hypertensive than men. Women have less successful PTCAs because they have a higher incidence of total occlusion; there are fewer successful crossings of the lesions. There is a higher incidence of emergency CABG following PTCA in women. There is also less success in decreasing women's anginal symptoms, and women also experience more complications and higher early mortality than men. Long term results, demonstrate similarities in men and women, with less re-stenosis and higher event free survival in women (Cowley, et al., 1985; Kindwall, 1989; Wenger, et al., 1993).

Cardiac Surgery

When more conservative measures are ineffective in treatment of symptoms of CAD or valve disorder, cardiac surgery may be the next treatment option. Surgical intervention is becoming more commonplace in women. In fact, between 1979 and 1984 the proportion of CABG surgery performed on women in the United States rose from 18 percent to nearly one quarter of all such surgeries (Eaker, Packard, & Thom, 1989). In Canada, between 1981 and 1987, approximately 20 percent of CABG surgery was performed on women (Heart and Stroke Foundation of Canada, 1993). Currently, approximately 27% of CABG surgery, and approximately one half of all valve surgeries are performed on women (American Heart Association, 1996).

Operative Risk of Cardiac Surgery

Women experience significantly more perioperative morbidity and

mortality than men when having CABG surgery (Carey, Cukingnan, & Singer, 1995; Cosgrove, 1993; Ennabli & Pelletier, 1986; Jeffery, Vijayanagar, Bognolo, & Eckstein, 1986), "despite a lesser incidence of prior infarction, multivessel disease, and abnormal left ventricular function" (Wenger, 1989, p. 179). For nearly 20 years, authors have reported that women have a greater incidence of perioperative MI, respiratory insufficiency, and stroke (Bolooki, Vargus, Green, Kaiser, & Ghahramani, 1975; Cosgrove, 1993; Loop, et al., 1983). Further, Loop et al. (1983) found there was also a higher incidence of atrial fibrillation and use of the intraortic balloon pump in women having CABG surgery. The outlook however, is not as grim for women facing valve surgery. Women who require surgery for a valve disorder, and have no concomitant CAD, are at no greater risk than their male counterparts when having valve surgery (Douglas, 1989; Lombard, 1994).

There are a number of factors which put women at higher risk when having CABG surgery. Women are typically referred for cardiac surgery at a later age and a more symptomatic stage of illness than their male counterparts (Steingart, et al., 1991; Wenger, et al., 1993). Women are also more likely to undergo emergency surgery (Cosgrove, 1993; Wenger, et al., 1993). Further, women's smaller size (body surface area) as compared to men's, is also a risk factor for successful bypass grafting (Loop, et al. 1983). Wenger (1989) concluded that female gender "better predicts perioperative coronary artery bypass graft surgery mortality than does severity of left ventricular dysfunction or severity of angina" (p. 179).

The notion of advanced age being a risk factor for women having cardiac surgery is somewhat complex and inconclusive. Although Johnston, Spyt, Reece, Hillis, and Dunn (1989) reported that there were no significant difference in CABG operative morbidity and mortality between groups under

the age of 65 and those 65 years and older, other authors would argue this is not so. For example, Cosgrove (1993) reported that advancing age is "the single most significant risk factor for morbidity and mortality among patients undergoing CABG" (p. 120). In addition, Logeais, Langanay, Roussin, et al. (1994) echoed this conclusion when studying patients having surgery for aortic stenosis. Though Jeffery, et al. (1986) found morbidity and mortality increase with age, gender was not considered an important predictor of morbidity or mortality in elders having cardiac surgery. Carey, Cukingnan, and Singer (1995) however, found that "younger age appeared to have an adverse impact on the survival of women" (p. 116). Although, Zehr, Lee, Poston, Gillinov, Greene, and Cameron (1994) report that the proportion of younger women undergoing CABG surgery is increasing, they concur with Ennabli and Pelletier (1986) in finding that women remain more likely to be older than their male counterparts when having cardiac surgery, have more comorbidities than men when presenting for cardiac surgery, and these comorbidities increase with age.

Age in association with the inherent increase in comorbidities increases the risk for morbidity and mortality for women having cardiac surgery. The CASS (Eaker, Kronmal, et al., 1989), Framingham Study (Eaker, Packard, et al., 1989; Wenger, 1989), and Cleveland Study (Cosgrove, 1993), reported a higher frequency of comorbidities (particularly diabetes, hypertension, peripheral vascular disease, valvular heart disease, chronic obstructive lung disease, and renal disease) in women having cardiac disease requiring surgery. These comorbidities contributed to an increased surgical risk.

Number of grafts for CABG surgery is also considered an operative risk factor. Although, women typically have less multivessel disease than men, when multivessel disease is present, the risk for women increases. Loop et al. (1983) reported that operative mortality increases for both men and women

with number of necessary grafts. With increases in number of necessary grafts, women had more perioperative myocardial infarction, atrial fibrillation, neurologic deficits, and required the intraortic balloon pump more often, than men.

Bolooki et al. (1975) found that intraoperative difficulties were "encountered more frequently with coronary vessels in women than men; the saphenous vein (as a donor vessel) in women is thin walled and, at times, aneurysmal" (p. 275). Surgeons were at one time less likely to use internal mammary artery donor grafts with women because, according to Loop et al. (1983), a myth existed that the internal mammary artery is too small for CABG use in women. Loop et al. found that the internal mammary artery graft patency was virtually equal in women and men. Many researchers would agree however, that there is an increased operative risk for women because women have smaller coronary arteries; leading to difficulty in anastomosis, reduced flow, and predisposing women to early graft closure (Steingart, et al., 1991; Tobin, et al., 1988; Ayanian & Epstein, 1991).

It has been acknowledged that women have a higher intraoperative morbidity and mortality than men, when having CABG surgery. However, Loop et al. (1983) were the first to question whether it was smaller size of women rather than gender that explained the difference in operative morbidity and mortality. They found that smaller people, regardless of gender, have increased operative risk due to the smaller coronary arteries, smaller heart size, and smaller thoracic cavity.

Recovery From Cardiac Surgery

Biophysical Factors

Recovery from cardiac surgery, whether CABG or valve, is complex; and includes concerns regarding mortality and postoperative complications, relief

of cardiac symptoms, improvement in health state and functional status, as well as return to premorbid employment or activities (Allen, 1990; Gortner, et al., 1988, 1989; Gortner, Jaeger, Harr, & Hlatky, 1994; Gortner, Jaeger, Harr, & Miller, 1994; Gortner & Jenkins, 1990; Low, 1993; Rankin, 1990). Once women are out of hospital, their mortality is similar to that of men. When considering CABG surgery, the CASS found that once women leave the hospital, there is no difference in survival rates between men and women (Eaker, Kronmal, et al., 1989). Further, Loop et al. (1983) found that five and ten-year longevity was nearly the same for men and women. When considering valve surgery (without concomitant coronary artery involvement), the survival rates are similar (Douglas, 1989; Lombard, 1994).

Although the long term survival for women having CABG surgery is virtually the same as for men, once operative mortality is taken into account, at any age the outlook for women is still not quite as bright as for men. Studies have reported that women are more likely to have angina on follow-up (Bolooki et al., 1975; Eaker, Kronmal, et al., 1989; Jeffery et al., 1986; Loop, et al., 1983). In the short-term, women "have less symptomatic improvement, more bedridden and restricted activity days, and a lesser and later return to work than their male counterparts" (Wenger, 1989, p. 179). Gortner, Jaeger, Harr, and Hlatky (1994) reported that "during the course of follow-up, (elder) women's perceptions of their recovery of health were lower than those of men at one month... and again at one year" (p. 21). Carey, Cukingnan, and Singer (1995) found that women had a poorer subjective health status than men for up to fifteen years postoperatively.

Women are referred less often for cardiac rehabilitation than men, despite some research suggesting that both men and women receive similar benefits (Low, 1993; Murdaugh, 1986, 1990; Wenger, et al., 1993). However,

"the positive effects of rehabilitation efforts in women are (largely) unknown due to the exclusion of females in large studies or the inability to obtain adequate female sample sizes" (Murdaugh, 1990, p. 44). Even when women are referred for cardiac rehabilitation, they have poorer attendance largely due to comorbidities, feeling guilty about family responsibilities, and other psychosocial factors (Hawthorne, 1993, 1994; Low, 1993; Murdaugh, 1986, 1990; Murdaugh & O'Rourke, 1988; Parchert & Creason, 1989; Wenger, et al., 1993).

Psychosocial Factors

Misra, Bain, and Mahmood (1982) noted that the critical difference in those who recover successfully and unsuccessfully from cardiac surgery, "is the degree to which they readjust to the postoperative life, in emotional, social, work and sexual (or psychosocial) areas" (p. 264). More recently, Penckofer and Holm (1990) advocated that "future studies should examine the expectations and quality of life of women before surgery" (p. 16) to better understand the nature of women's psychosocial recovery from cardiac surgery.

Rakoczy (1977) in a study focusing on waiting for cardiac surgery, found that psychological disturbances, such as depression and anxiety, are reported by women more frequently. In addition, psychological disturbances have been found to be more problematic for women, and more likely to occur in women following cardiac surgery (Douglas et al., 1981; Kos-Munson, Alexander, Hinthorn, Gallagher, & Goetz, 1988; Wilson-Barnett, 1981; Wenger, 1989), and following MI (Boogaard, 1984; Low, 1993; Mickus, 1986). Other studies found there is actually little or no difference between men and women with regard to psychological disturbances, when comparing pre and post operative ratings of anxiety and depression (Althof, Coffman, & Levine, 1984; Rankin, 1990; Sokol, Folks, Herrick, & Freeman, 1987). The

contrast in study findings is notable. Since the social and historical context in which research is undertaken influences both the questions asked and interpretations of the findings, one might postulate that issues that are more meaningful or appropriate for women are being studied in more recent research.

Roles and Relationships. Fowlkes (1987) identified that the "relationships of everyday life are intrinsically social. Individuals consistently act and interact according to culturally prescribed understandings of what is appropriate and expected of them" (p. 3). Although, determination of self-identity is not necessarily a gender-based phenomenon, men tend to use a context of separation and autonomy to develop their sense of identity, while women tend to do so in the context of relationships and connections to others (Belenky et al., 1986; Gilligan, 1982, 1987; Miller, 1991; Nadelson, 1983; Parchert & Creason; 1989). Parchert and Creason (1989) consider "women's lived experiences and the social context of their relationships... as important elements of self-definition" (p. 60) when facing cardiac illness. Therefore this approach of coming to understand women's social role or social context, may be particularly useful when developing an understanding of women's experiences during intervention and recovery from cardiac surgery (Blumenthal & Matthews, 1993; Collier, 1982; Hawthorne, 1994).

Blumenthal and Matthews (1992) maintain that cardiac "care should promote women's quality of life, not only extend life. To evaluate the efficacy of prevention and treatment, health care professionals should measure a woman's ability to perform work, family, and social functions... (because) women have unique social roles" (p. 110). When considering the notion of women's social role, facets such as marital status, employment status (whether she works inside or outside the home), children (number and age of) and role

expectations from herself and her family (Murdaugh, 1986; Nadelson, 1983; Nathanson, 1975; Steil & Turetsky, 1987) have been identified as both highly integrated and highly pertinent.

It is apparent that "there has been a shift in focus away from the stressful and toward the beneficial effects of occupying different roles" (Gove & Zeiss, 1987, p. 125). Although having multiple role expectations was thought to have a detrimental effect on women's health (Brown & Rawlinson, 1976, 1977; Gove, 1978, 1984; Marcus & Seeman, 1981), more recent authors (Hibbard & Pope, 1985; Waldron & Jacobs, 1989) have claimed that multiple role expectations can be health enhancing. In summary, more recent studies on gender and multiple social roles indicate that women who are happily married, have fewer children (or whose children are grown), work in higher paid/higher status positions outside the home, and have families (particularly husbands) that function to support them in these multiple roles, seem less likely to experience depression, anxiety, and poorer emotional adjustment, which have been claimed to be more common in women (Baruch & Barnett, 1987; Gove & Zeiss, 1987; Steil & Turetsky, 1987). When studying British women recovering from cardiac surgery, Gould and Wilson-Barnett (1985), found that their recovery was influenced by marital status in that "recovery (was)... less good among single cardiac patients who lived alone" (p. 317). The Framingham study indicated that whether a woman is employed inside or outside of the home is not related to the occurrence of CAD. However, the type of employment outside the home is an element in assessing risk. Though not statistically significant, women in the Framingham study who were employed in `blue collar' jobs had a higher incidence of CAD than those women who were in `white collar' jobs. Also, level of education was a significant variable in the assessing risk for development of CAD in women (Eaker, Packard, et al.

1989; Wenger, 1989).

Despite these `ideal' conditions, Murdaugh (1986) and Penckofer and Holm (1990) caution that for women, multiple role expectations can influence both the incidence of CAD and how women fare post operatively from CABG surgery. Murdaugh suggests that women who are engaged in multiple and demanding roles have less time to pursue healthy lifestyle choices that include reaching a balance between exercise and relaxation. Additionally, women under stress from multiple role expectations may engage in higher rates of smoking and develop higher cholesterol levels.

Steingart et al. (1991), when concerned about the delay in referring women for investigation and treatment of cardiac disease, questioned whether women are better at making life adjustments than are men and are therefore less likely to push for surgery than their male counterparts. They questioned whether the responsibilities that women have with family, homes, etc. may also cause them to postpone surgery, or not see surgery as an acceptable alternative--as men do. A number of authors concur that issues regarding women's social roles and the social context in which their cardiac disease and surgery occur, have not been adequately explored and ought to be pursued (Allen, 1990; Hawthorne, 1993; Murdaugh, 1986; Parchert & Creason, 1989; Penckofer & Holm, 1990; Sokol et al., 1987; Yates, 1987).

Following cardiac surgery (and myocardial infarction), women often engage in activities that are potentially detrimental to their recovery and their cardiac health in general. Women generally return to performing physical activities with higher energy requirements and resume household and role related activities sooner than men (Boogaard, 1984; Hawthorne, 1993; Low, 1993; Mickus, 1986; Sharpe et al., 1991). Parchert and Creason (1989) concluded that:

> Women increase their activity levels by performing more household activities, which are primarily anaerobic in nature and are therefore of little benefit in improving cardiovascular functional capacity... Men, on the other hand, engage in aerobic exercise such as walking and structured rehabilitation programs, thereby improving their cardiovascular function (p. 58).

Blackburn and Jacobs (1988) found that women do not engage in the same type of beneficial regular physical activity as men because they have less time due to multiple role expectations.

Issues Related to Aging. Older women who are recovering from cardiac surgery or MI, are more likely to be living alone (due to spousal death), lack access to in-home caregiving, and have more financial difficulties than their male counterparts (Sharpe, et al., 1991; Young & Kahana, 1993). Sharpe, et al. (1991) found that although household responsibilities remained a concern for older women (as they do for their younger counterparts), the women did not "differ from men with regard to perceptions of the impact of their condition on psychosocial functioning" (p. 39).

In a study of Alberta women having cardiac surgery, King (1993) found from the onset of illness, older (over 65 years) women seemed to approach the process of having cardiac surgery as a challenge as opposed to a threat; a challenge that the older women succeeded in meeting. Although the older women had more difficulty in convincing others of their symptoms and need for surgery, endured longer intensive care unit stays, and more complications following their surgery, they reported a qualitatively more positive outcome than the younger group. These findings are consistent with findings of Varvaro (1993) when studying older (over 65 years) and younger women following MI or CABG surgery. Older women in this study reported "a higher sense of

pride... (and) a significantly higher perception of life satisfaction" (p. 285). The older women also had fewer problems with role adjustment and emotional concerns than their younger counterparts. Wagnild and Young (1990) call this ability in older women to perceive situations in a more positive light, `resilience'. Resilient older women in Wagnild and Young's study, "viewed their lives with a positive and future-oriented attitude... reflected self-awareness and recognition of limitations, a belief in... (themselves) and a positive comparison with others, leading to a perceived satisfaction of successful psychosocial adjustment" (p. 253).

Steingart (1992) contends that quality of life and other psychosocial issues should be addressed when studying and treating elderly women who have cardiovascular disease, particularly because women with cardiovascular disease endure increased morbidity in the later years. Further, though older women are generally more ill preoperatively and have poorer operative mortality, Steingart reminds practitioners that elderly women have increased survival benefits following cardiac surgery; they feel better when the surgery is completed.

Summary

Women's recovery from cardiac surgery is not well understood, particularly from a perspective that acknowledges the multidimensional nature of this process. Women's recovery from cardiac surgery needs to be explored from a perspective that not only encompasses a `biopsychosocial' view of recovery, but which also attends to aspects of recovery that are pertinent and of concern to women in that they are so identified.

Recovery from cardiac surgery has been called a `complex construct' of which physical recovery and "is only one of many potential indicators" (Christman et al., 1988, p. 81). For many years, relationships between the

psychosocial and biophysical aspects of cardiac surgery outcomes have been acknowledged (Kimball, 1969a, b). Jenkins et al. (1983) found "self-perceptions and emotions contribute more to the general sense of well-being than does the presence of physical symptoms" (p. 786).

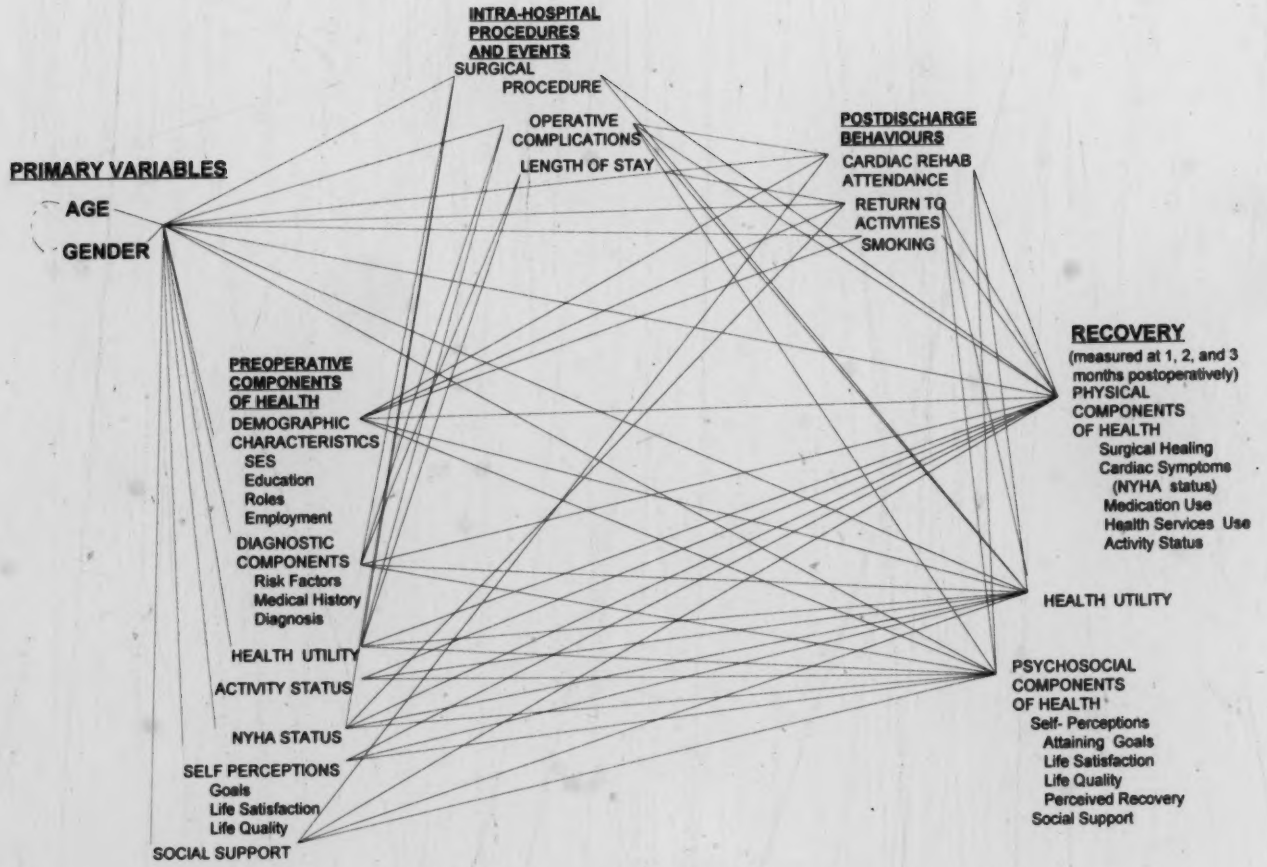
In the early part of the last decade, authors (Gundle, Reeves, Tate, Raft & McLauren, 1980; King, 1985; Mumford, Schlesinger, & Glass, 1982; Stanton, Jenkins, Savageau, Harken, & Aucoin, 1984) encouraged pursuit of research regarding psychosocial outcomes of cardiac surgery in both men and women. Attention to women's experience and recovery from cardiac surgery has increased in the last decade (Althof, Coffman, & Levine, 1984; Ayanian & Epstein, 1991; Blumenthal & Matthews, 1993; King, 1985; King & Jensen, 1994; King, Clark, & Hicks, 1992; Low, 1993). Despite promising interest in this area of research, few conclusions have been drawn which connect biophysical and psychosocial aspects of cardiac surgery outcomes. Research of this nature would aid in developing a more comprehensive picture of this experience for women and may more positively and precisely influence practice in women's cardiac surgery recovery care.

Conceptual Framework

Recovery has been identified as a complex construct including a variety of biophysical and psychosocial aspects. Perry (1994) argues that "human responses to health and illness... cannot be viewed within a holistic context without attention to biological (as well as intrapersonal and social) phenomena" (p. 486); one phenomenon of concern cannot be studied without some consideration of the whole of the individual. Analysis of data from the cohort of Californian women following cardiac surgery (King & Gortner, 1996) indicates that there was statistically significant improvement in one biophysical factor (NYHA Classification $F(78,3)=53.06$, $p<.001$) and all

psychosocial factors (perceived life quality $F(78, 3)=7.26$, $p<.001$; perceived life satisfaction $F(78,3)=5.31$, $p=.002$; and perceived recovery $F(78,3)=13.28$, $p<.001$) measured over a three month period. However, no significant differences were found in the objective measures of activity ($t=-.28$, $p=.781$) or health state ($t=-1.37$, $p=.182$) from the preoperative to three month postdischarge assessment. The biophysical factor of activity was correlated with the biophysical factor health status ($r=.44$, $p=.02$), and psychosocial factor of perceived quality of life ($r=.45$, $p=.02$) at three months postdischarge.

Women's recovery from cardiac surgery was examined from a multidimensional model derived from King and Gortner's study (1996) which includes biophysical, intrapersonal, and social aspects. The conceptual model (see figure 1) developed for this research, demonstrates that recovery cannot be seen as linear. The biophysical, intrapersonal, and social characteristics that subjects bring preoperatively, intra-hospital events, and postdischarge events influence recovery.



Footnote: Correlations exist among phase variables.

Figure 1. Conceptual Framework of Factors Influencing Short-Term Recovery from Cardiac Surgery.

CHAPTER 3

Design and Methodology

Research Design

A prospective correlational design was used to examine and describe the influence of age and gender on biophysical, intrapersonal, and social components of Alberta women and men's short-term recovery from cardiac surgery (over a three month period from time of operation). Relationships between age and gender and their effects on biophysical, intrapersonal, and social characteristics as they pertain to recovery, were also examined as predictors of recovery. Narratives of the subjects were analyzed for emerging themes and presented to enhance quantitative analysis.

Sample

Women and men entering the University of Alberta Hospitals, Edmonton and the Foothills and Holy Cross Hospitals, Calgary for cardiac surgery were sought as potential subjects. Rather than sample patients randomly or in a manner reflecting the total population that would yield an approximate ratio of 80 men to 20 women, a stratified sample was recruited. Much research to date has sampled women and men based on this `normal' gender ratio. However, a stratified sample would enable more meaningful comparisons between age and gender groups.

Subjects were asked to participate in the study based on their gender, age, and availability to ensure equal numbers of women and men, and equal numbers of those less than 65 years and those greater than or equal to 65 years of age. Those people who were scheduled to have cardiac surgery at the University of Alberta Hospital, Foothills Hospital, and Holy Cross Hospital, and who were not in an intensive care unit awaiting surgery, were requested to participate in this study. They needed to be able to speak and read the English

language, be living outside of an institution, have access to a telephone following surgery, and be willing to participate in at least four interviews. Those women and men who had other cardiac surgical procedures that were not CAD- or valve-disorder related, who resided in a nursing home or long-term care facility, had any obvious neurological or psychiatric disorder that would inhibit self-reflection or ability to communicate, who did not speak and read the English language, or who did not have access to a telephone for follow-up contact, were not considered for enrollment in this study.

Sample size was determined based on power analysis of the statistical procedures planned for use to analyze the primary and secondary questions. Since a formidable and costly procedure such as cardiac surgery should bring about consequential changes in a person's cardiac function and health state, and the measures used are purported to be sensitive to change in cardiac function, health state, and self perceptions, a large effect size (ES=.40) ought to be expected. Thus, to have adequate power (.80) to analyze the primary question assessing the effect of age (two groups; those $\geq$65 years, and those < 65 years) and gender (two groups; male and female), and using ANOVA (two tailed alpha=.05), with two (functional status, health state) and four (self perceptions of recovery, NYHA status) repeated measures respectively (u=1 and u=3, respectively), 104 and 72 subjects were required respectively (Cohen, 1988).

The plan for analysis of the secondary question included using multiple correlation and multiple regression procedures. Power analysis, as explained by Cohen (1988), is not appropriate for analyses in which comparisons between groups is not made. Thus, to have adequate power in analyzing the secondary questions, sample size may be determined based on case-to-variable ratio as described by Tabachnick and Fidell (1989). Although data were collected on a

large number of variables, multicollinearity among these variables was expected. Thus, the most conceptually and statistically significant (as determined by multiple correlations) variables were chosen for the final independent and dependent variable(s) for multiple regressions. Therefore, expecting ten to twelve independent variables for multiple regression and using the cases-to-independent variable ratio of 10:1, approximately 120 subjects were needed for this study. Thus, to have sufficient power to analyze all research questions, 120 subjects (complete data sets), 60 men and 60 women, with 30 of each gender group <65 years, and ≥65 years of age were sought for this study.

Sample Access Procedures

Potential subjects for this study were identified from the surgical waiting lists at the respective hospitals. Potential subjects were contacted by the researcher or assistant when they were admitted to hospital for surgery. The purpose of the study, necessary time commitment, and ethical considerations were explained to the subject before seeking informed consent. Once the study had been explained, and the subject signed the informed consent (Appendix A), preoperative data were collected.

Protection of Human Rights

The appropriate medical and nursing administrators and stakeholders at each hospital were contacted to seek their support of this study. The protocol for this study was also subject to review by the Faculty of Nursing and the Faculty of Medicine and Oral Health Sciences, University of Alberta; the Capital Health Authority Special Services and Research Committee, for the University of Alberta Hospital; the Research and Development Committee, Foothills Hospital and University of Calgary, Faculty of Medicine, Conjoint Medical Research Ethics Board, for the Foothills Hospital; as well as the

Calgary District Hospital Group Research Committee, for the Holy Cross Hospital.

Ethical Considerations

There were some possible risks or discomforts from being in this study: the subject may have found completion of the checklists and discussions tiring. The subject was advised that he or she could decline to answer a question or stop the interview at any time. The data were kept confidential by replacing names on measures with an assigned code number. The linkage between the code number and subject (on code sheets) was known only to the researcher. The code sheets were stored in a separate locked cabinet apart from the collected data. Any reference or description that would make the subject easily identifiable, particularly in narratives, were excluded from any final reporting, any published or presented papers, or any further analysis of the data.

Informed Consent Procedures

The subjects were informed about the consent procedures before any data collection had occurred. The purpose of the study and the time commitments were stated verbally to the subject before asking for her/his consent to participate. When the subjects were contacted by phone postoperatively, they were regularly reminded of the study's purpose and of their ethical rights regarding participation in the study.

Interview Guides and Measures

The interview guides and measures for this study included the Preoperative Interview Questionnaire, Medical Record Abstract, Duke Activity Index (Hlatky, Boineau, Higginbotham, Lee, Mark, Califf, Cobb, & Pryor, 1989), McMaster Health State Classification System (Feeny, Furlong, Barr, Torrance, Rosenbaum, & Weitzman), Shortened Social Support Scale (Funch, Marshall, and Gebhardt, 1986), and Self-Report of Recovery Questionnaire.

Unpublished and modified questionnaires are located in Appendix B.

Preoperative Interview Questionnaire

This interview questionnaire was originally developed at the Cardiac Recovery Laboratory, University of California, San Francisco and used by Rankin (1989, 1990) to obtain preoperative information from patients regarding personal treatment goals, current perceptions of life quality, life satisfaction, planned recovery, plans for home going (including where they would recover and what family or other resources would be used), and an interview account of NYHA status (providing a check on data obtained from the medical record). Versions of this interview guide were used by Rankin (1990), Gilliss, Gortner, Hauck, Shinn, Sparacino, & Tompkins (1993), and Gortner, Jaeger, Harr, and Miller (1994), with a variety of patient populations who were awaiting cardiac surgery and in conjunction with the Postoperative Self Report of Recovery Questionnaire described below. The Preoperative Interview Questionnaire has been modified based on findings from the King and Gortner (1996) study.

Duke Activity Status Index

This measure was developed to more precisely determine functional capacity of cardiac patients. It is a 12-item questionnaire that gauges an individual's "ability to perform common activities and uses the responses in a weighted score that assesses overall... functional capacity" (Nelson, et al., 1991, p. 973). Correlating well with peak oxygen uptake on treadmill tests with cardiac patients, this measure is more precise than the traditional classification systems (i.e. New York Heart Association Class) and should permit smaller, more specific differences in functional capacity to be recognized (Hlatky, et al., 1989). This measure was used by Jaeger, Hlatky, Paul, and Gortner (1994) as a proxy for activity level in a cohort of Northern California cardiac elders. It

has also been used as an indicator of activity level when studying women's recovery from cardiac surgery (Gortner, Jaeger, Harr, & Hlatky, 1994; King & Gortner, 1996).

McMaster Health State Classification System

The McMaster Health State Classification System has tested extensively in population health studies for reliability and validity. It has been used widely in one form or another (Feeny, personal communication, 1994) in both pediatric (Feeny, et al., 1992) and adult populations (Meagher, 1987; O'Boyle, McGee, Hickey, O'Malley, & Joyce, 1992; Packa, 1989; Packa, Branyon, Kinney, Khan, Kelley, & Miers, 1989). This system has a number of recommended uses, however, in this study it is used "to provide a single summary measure of health-related quality of life for patients" (Torrance, Feeny, Furlong, & Boyle, 1995, p. 517). Originally developed by Feeny, et al., the system includes six dimensions of physical, social, and emotional aspects of health status. "The system encourages clinicians to take into account the full array of the dimensions of health status and to focus on global health-related quality of life as well as specific limitations" (Feeny, et al., p. 927). It has been modified by Gortner for use in an American Heart Association-funded study (Gortner & Hlatky, 1991, AHA 910008810, `Cardiac Surgery Recovery in the Elderly'), as a measure of global health status.

For this research, the McMaster Health State Classification System was scored using the health utility guidelines, as these were shown to demonstrate more predictive validity (Torrance, et al., 1995). The score derived from this measure "is the utility of the health state... where dead has a utility of 0.00 and health has a utility of 1.00. Because the worst possible health state was judged by respondents as worse than death, it has a negative utility of -0.02" (Patrick & Erickson, 1993, p. 384). Research done by Gortner's team was the first to

use this version of the system successfully with an elderly adult population recovering from cardiac surgery (Gortner, Jaeger, Harr, & Hlatky, 1994; Gortner, Jaeger, Harr, & Miller, 1994). In addition, this version of the system was used in King & Gortner's (1996) work focusing on women's recovery from cardiac surgery.

Shortened Social Support Scale

This brief 5-item scale developed by Funch, et al., (1986), can be used to yield a general measure of social network size as well as the perceived nature of that social support. This scale enables subjects to both identify breadth of support sources as well as perception of whether the support received is indeed positive. For this study the Shortened Social Support Scale was used to indicate "the average amount of perceived support from available sources" (Funch, et al., p. 338). Social support was explored in conjunction with other questions on the Preoperative Interview Questionnaire and the Postoperative Self Report of Recovery Questionnaire. This scale was used by Rankin (1989) when studying patient recovery from cardiac surgery and their caregivers.

Postoperative Self Report of Recovery Questionnaire

This questionnaire was developed at the Cardiac Recovery Laboratory, University of California, San Francisco and has been used in cardiac surgery populations to elicit responses regarding subjects' perceptions of recovery and biophysical and psychosocial factors related to recovery from cardiac surgery (Gortner, Gilliss, Shinn, et al., 1988, 1989; Gortner, Jaeger, Harr, & Hlatky, 1994; Rankin, 1989, 1990). The measure includes questions regarding return to activity, cardiac rehabilitation attendance, medication use, experience of common cardiac and postoperative symptoms, use of medical and nursing services, as well as self-reports of NYHA classification, life quality, life satisfaction, and perceived recovery. The final interview questionnaire includes

questions regarding the subject's attainment of treatment goals and perceptions of the experience. This questionnaire has been enlarged for use in this proposed research based on findings from the King and Gortner study (1996).

Medical Record Data Form

This audit form was designed by the Cardiac Recovery Laboratory, University of California, San Francisco to collect pertinent medical record data regarding subjects medical diagnoses and cardiac surgical procedure(s). Data collected using this form included demographic information, admission diagnosis, medical history (including risk factors, myocardial function, extent of vessel disease), NYHA class, surgical procedure, complications, conduits used, number of days in intensive and step-down care, and medications used at discharge.

Reliability and Validity of Measures and Measurement Process

Correlational designs require a high degree of reliability of measures and of the measurement process. The nature of the measures (particularly when using the Duke Activity Status Index and the McMaster Health State Classification) and the dynamic process of recovery from cardiac surgery, render many of the common means of establishing reliability of measures inappropriate in this context. Thus, this problem will be discussed at length. Issues related to validity will also be discussed.

Reliability

Reliability of measures is commonly determined by measuring internal consistency, stability, and equivalence (Brink & Wood, 1994; Erickson, 1990; Waltz, Strickland, & Lenz, 1991). The Duke Activity Status Index and the McMaster Health State Classification System are criterion referenced measures. The McMaster Health State Classification System measures a variety of separate constructs, whereas the Duke Activity Status Index

measures a variety of levels of the same construct. Thus measuring for internal consistency to establish reliability is not appropriate. Test-retest reliability is often used as a benchmark to measure stability for criterion referenced measures. However, this is particularly difficult to use since aspects of cardiac illness and recovery from surgery change quickly over time. However, inter-rater reliability was established when using the measures, interview guides, and medical record audit form. Though measuring equivalence through use of parallel or alternate forms might be weaker indicators of reliability, correlations were run for similar measures and like variables.

Since the measures were used by more than one person (the researcher and research assistants), it was necessary to establish inter-rater reliability in the measurement process. Inter-rater reliability procedures provide no assessment of the subject's ability to use the potentially self-administered scales in a consistent manner (Wewers & Lowe, 1990), but was a means by which an estimate of the consistency of raters' interpretation of subject responses could be determined (both for quantitative and qualitative data with all measures).

The researcher and research assistant simultaneously collected data on subjects until a >95% agreement was achieved. After the subject had been informed regarding the procedures and signed a consent, the researcher and the assistant simultaneously collected data using the Duke Activity Status Index, the McMaster Health State Classification System, Shortened Social Support Scale, and the Preoperative Interview Questionnaire. Some preoperative interviews were guided by the researcher, and others by the assistant. They were then compared for consistency of documentation and accuracy of response coding. For the postoperative telephone interviews, the subject was asked about willingness to have the interview audited. If the answer was

affirmative, a telephone speaker was turned on and the interview completed, guided by the researcher or the assistant as a means of controlling for potential differences in administration of questionnaires and coding. If the subject declined to have the interview audited, the interview progressed between the researcher and subject on a regular telephone line.

Reliability of the qualitative data elicited through the interviews especially at the three-month postoperative interview and interpretation of that data, as Munhall (1989) identifies rests with the interviewer as the `primary instrument' in qualitative research. The researcher and assistants had numerous opportunities to establish a rapport with the subjects, both in person and by telephone. In King and Gortner's (1996) study, the women identified this opportunity as a strength of the research process. Subjects were interviewed using many of the same questionnaires over a period of time. This gave them an opportunity to anticipate responses that they may have wished to share with the researcher. These opportunities were used to establish stability of some responses over time and internal consistency of the interviews (Brink, 1991). Accuracy of transcribing the data was assured by checking the typed reports with the original data.

As analysis of the qualitative data proceeded, and thematic codes were established, a research assistant was asked to review approximately 50% of the coded interviews to establish inter-rater reliability. This process was continued until the researcher and assistant were in agreement more than 95% of the time.

Validity

As a means of controlling for researcher bias related to hypothesis guessing, the research hypotheses or questions were never shared with the research assistants or the study subjects. They were told only that the focus of

the study was cardiac surgery recovery.

Validity of measurement "refers to the extent to which a measure achieves the purpose for which it was intended" (Waltz, Strickland, & Lenz, 1991, p. 172). The Duke Activity Status Index has been determined to be a valid measure of functional capacity since it correlates (concurrent validity) more highly with peak oxygen uptake than other traditional scales (Hlatky, et al, 1989). Further, the scores using this measure "vary in a consistent manner according to factors known to affect patient functional capacity. This finding provides additional validity to the use of DASI as a functional outcome measure. In addition, this... study shows significant measurable differences in DASI scores between groups of patients with varying severity of heart disease" (Nelson, et al., 1991, p. 975) thereby demonstrating discriminant validity.

The McMaster Health State Classification System has been identified as a "compact but comprehensive method for describing the health status" (Feeny, et al., 1992, p. 927) of patients. Health researchers such as Shumaker and Cazjkowski (1993) have determined that health-related quality of life is "at minimum, physical and social functioning and emotional health. In addition, most investigators include neuropsychological (or cognitive) functioning, productivity and intimacy as dimensions of health-related quality of life" (p. 149). The McMaster Health State Classification System includes all of these components; demonstrating content validity.

Difficulties arose when using the McMaster Health State Classification System for this particular study. Despite having experience with this measure in for the King and Gortner (1996) study, subjects were not given a wide enough `window' in which to consider and then report whether they had pain or the degree to which they had experienced pain when responding to this particular component of the measure (personal communication, D. Feeny, July,

1996). Specifically, the problem arose with validity of the scoring when a small group of subjects (most of whom had encountered confinement to hospital on intravenous heparin infusions, waiting in hospital for urgent surgery while post myocardial infarction) reported having no pain. These subjects had NYHA classifications of II- IV, and low Duke Activity Status Index scores. Yet, their scores on the McMaster Health State Classification System remained quite high because the pain component of this measure had been inappropriately scored. Thus, after consultation with the system's originator, David Feeny and others, the pain scale was modified to `fit' cardiac patients. The pain scores for all subjects were reviewed using the new modifications, and if necessary other interview data (including NYHA classification, Duke Activity Status Index score, open ended answer to first preoperative interview question) were used to help make a decision whether to revise the pain score. If there was any doubt on the part of the researcher, another cardiac nurse familiar with the study was consulted, and agreement was reached about a new score. Since the pain component data were not original scores, any conclusions regarding health state must be viewed cautiously.

The scores from the Shortened Social Support Scale indicate the average amount of perceived social support from available resources. The scores from this scale have been demonstrated to not vary with age or gender differences (Funch, et al., 1986), thus were appropriate for use with this study sample. This measure has been supported in criterion and construct validity assessments, and has predicted psychological status in a variety of patient populations.

The Preoperative Interview Questionnaire, Postoperative Self-Report of Recovery Questionnaire, and the Medical Record Data Form have been used in a variety of studies to elicit data. Content validity has been established as

these instruments elicit data necessary to measure recovery from cardiac surgery. Further, items on these instruments' information that can concurrently validate areas measured by the other instruments.

Construct validity of the Duke Activity Status Index, the McMaster Health State Classification System, the New York Heart Association Class, self-reported life quality, and life satisfaction has been demonstrated by findings of significant correlations between these measures (King & Gortner, 1996). When these measures were given to women before their cardiac surgery, correlations were as follows:

	McMaster	NYHA	QOL	LifeSat
Duke	r=.435 p=.01	r=-.556 p=.001	r=.523 p=.003	r=.647 p<.001
McMaster		r=-.411 p=.02	r=.633 p<.001	r=.517 p=.003
NYHA			r=-.407 p=.02	r=-.442 p=.01
QOL				r=.799 p<.001

Thematic codes established through the analysis of qualitative data were reviewed and corroborated by the researcher and a research assistant.

Data Collection Procedures

Potential subjects for this study were identified according to criteria described above. The researcher or assistant met the potential participants when they were admitted to their respective hospitals, or were waiting in hospital for their surgery. At that time, the research process was described and consent obtained. The preoperative interviews were then conducted by the

researcher or assistant. If the subject's surgery was delayed or rescheduled for a time longer than one month following the initial interview, preoperative data were to be recollected to ensure that it was current. However, this plan did not need to be enforced as only one subject had her surgery postponed and she returned for surgery within two weeks. The chart audits were done by the researcher or assistant once subjects had been discharged from hospital. Data collection was then continued primarily by research assistants, by telephone at one month, two months, and three months postoperatively.

Subjects were asked to spend approximately 20 minutes preoperatively. Using the Duke Activity Status Index, Preoperative Interview Questionnaire, Shortened Social Support Scale, and McMaster Health State Classification System, interviews were conducted to collect preoperative information. Once subjects had been discharged from hospital, data were collected from a medical record review using the Medical Record Data Form. The subjects were then contacted by telephone at one, two, and three months postoperatively. They were asked to spend approximately 15-20 minutes answering questions from the Postoperative Self-Report of Recovery Questionnaire. At three months following discharge the Duke Activity Status Index, McMaster Health State Classification System and the Shortened Social Support Scale were used in addition to the Postoperative Self-Report of Recovery Questionnaire.

Data Analysis

The Duke Activity Status Index is a summative scale in which the sum of the weighted units is calculated. The McMaster Health Status Index comprises the multiplicative total of weighted scores of the six constructs of assessment. Each separate construct of the measure is rated, weighted, then multiplied in an equation rendering a score deemed utility of the health state (Patrick & Erickson, 1993). The score from the Shortened Social Support

Scale is comprised of the mean score of the sources identified as available to the subject. Otherwise, questionnaire responses are coded either by category, yes/no, or to degree of response.

Qualitative data coding was done through cutting and pasting using the Word Perfect 6.0 for Windows™ computer program. Data gathered were transcribed verbatim from the notes made by the researcher or assistants. The transcribed data was then categorized into emerging themes for presentation.

Descriptive statistics were used to summarize the data. Frequencies were run to provide a general description of sample characteristics, including trends for differences between gender and age groups. Multiple correlations were run for further description of the data; determining the degree of relationship between the psychosocial and biophysical measures, and between subjective and objective measures of recovery. These correlations were also used to assess for the expected collinearity between the variables.

Analysis of variance tests were used to explore differences between groups and over time for interval level data. Levine tests for homogeneity of variance were run to assure that this ANOVA assumption was not violated. However, if this assumption was violated, rather than use transformations of the data to resolve the violation (which occurred due to skewness of the data rather than outliers), the parametric analysis was run with the data as it formed naturally and nonparametric analysis was run to confirm or refute the parametric findings.

Repeated measures MANOVA were used to determine the effect of age and gender on health state (McMaster Health State Classification System), functional status (Duke Activity Status Index), social support (Shortened Social Support Scale), perceived life quality, perceived life satisfaction, and perceived recovery. Actual effect size of the repeated measures was determined

to assess for sensitivity of the measures. Statistical analysis and the original guided decisions regarding which variables would be used in the final multiple regression equations. Multiple regressions were used to determine which factors may influence or be predictive of recovery from cardiac surgery.

Missing Data

Interviews

If a subject could not be reached with consistent effort over a period of one week, the monthly interview was counted as missing and attempts were made to contact the subject again at the next scheduled interview time. If the subject was unable to participate due to postoperative complications or illness, the nature of the problem was recorded and the subject was contacted again at the next scheduled interview time. If a subject was unavailable/unable to participate in one or two of the requisite interviews postoperatively at time of data analysis, missing data for data analyses using ANOVA and MANOVA, were substituted with the calculated average value of the responses from those of like gender and age stratification. If a subject was unavailable/unable to participate in all three of the follow-up postoperative interviews, no data substitution took place and this subject was not used for short-term follow-up analysis.

Individual Questions

Although the initial plan included a procedure to follow should there have been missing data on a large number of subjects (>10%) for a specific variable, this plan was not put into action. Subjects did not refuse to answer any questions at a rate that would promote suspicion about the question. There were large numbers of medical records that did not include cardiac angiography or cardiac catheterization reports, thus those variables were not used.

CHAPTER 4

Findings

The study questionnaires and measures yielded both numerical data from the structured questions, as well as non-numerical data from the open-ended questions. Coding schemes and tabulated findings for open-ended questions are located in Appendix C. These data and analyses will be presented in an integrated fashion, where possible, as the purpose of asking open-ended questions was to provide opportunities for subjects to express their opinions, and to enhance or supplement responses to the structured questions. The numerical data were examined statistically to describe the sample and determine if gender or age group differences existed. The non-numerical data are for descriptive purposes; any obvious differences between gender or age groups are simply described.

The sample will be described through analysis of sociodemographic data, reasons for having cardiac surgery, preoperative cardiac status and health history, and other baseline data including expected benefits of having the surgery. In addition, descriptors of the primary expected caregivers of the sample will be included. Thereafter, findings regarding the subject's recovery will be presented for one month, two month, and three month postoperative times. At the end of this chapter, an integrated analysis of the structured data will be done using repeated measures MANOVA, and multiple regression.

Characteristics of the Sample

Subjects were recruited while in hospital waiting to have their cardiac surgery. At the time of recruitment, most demographic and baseline data were collected during that in-person contact with the researcher or assistant. Other demographic data were derived from the medical record abstract which was completed once the subject had left the hospital.

Sociodemographic Characteristics

Subjects were asked about their current living arrangements; whether they lived with a spouse, children, partner, friend, or alone. The following table represents the responses described separately for gender and age groups.

Living Arrangements	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
With Spouse	93% (56)	77% (46)	92%(55)	78% (47)
With Son	2% (1)	2% (1)	0%	4% (2)
With Daughter	2% (1)	2% (1)	4% (2)	0%
Alone	3% (2)	20% (12)	5% (3)	18% (11)

More women (χ^2=8.12, p=.044) and more older people (χ^2=9.19, p=.027) than expected lived alone.

Subjects were also asked to respond to a question regarding their level of education. If there was any doubt regarding the answer, due to differences in country of origin levels of education, it was left to the subject to identify which level was most appropriate for him or her.

Highest Level of Education	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
6th grade	13% (8)	8% (5)	8% (5)	13% (8)
9th grade	27% (16)	32% (19)	23% (14)	35% (21)
11th grade	10% (6)	12% (7)	8% (5)	13% (8)
High-school	17% (10)	28% (17)	28% (17)	17% (10)
Partial Postsecondary	7% (4)	8% (5)	7% (4)	8% (5)
Postsecondary	18% (11)	12% (7)	20% (12)	10% (6)
Graduate School	8% (5)	0%	5% (3)	3% (2)

There were no significant differences between genders for level of education. However, there were significant differences (U=1407, p=.035) between age groups for education; older people had lower levels of education than younger

their younger counterparts.

Subjects were also asked to categorize their employment status.

Employment Status	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
Employed	30% (18)	15% (9)	37% (22)	8% (5)
Not employed (most often homemaker)	0%	28% (17)	15% (9)	13% (8)
Leave of Absence	17% (10)	10% (6)	23% (14)	3% (2)
Retired	48% (29)	47% (28)	20% (12)	75% (45)
Disability Pension	5% (3)	0%	5% (3)	0%

There were significant differences (χ^2=24.02, p<.001) between genders in employment status; more women than expected were not employed. In addition, there were significant differences (χ^2=41.87, p<.001) between age groups in employment status; generally, more older people than expected (statistically) were not employed.

Nature of Work	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
Professional	25% (15)	8% (5)	18% (11)	15% (9)
Administrative	12% (7)	3% (2)	10% (6)	5% (3)
Small business	13% (8)	2% (1)	7% (4)	8% (5)
Clerical	2% (1)	25% (15)	15% (9)	12% (7)
Skilled	28% (17)	13% (8)	25% (15)	17% (10)
Unskilled	5% (3)	13% (8)	3% (2)	15% (9)
Farming	13% (8)	3% (2)	5% (3)	12% (7)
Homemaking	0	28% (17)	15% (9)	13% (8)
Other	2% (1)	3% (2)	2% (1)	3% (2)

Differences between gender and age groups were explored with respect to nature of work. More women than expected (statistically) held more lower paying/status jobs and were homemakers more frequently than men (χ^2=51.92, p<.001). However, there were no significant differences in age

groups for the nature of work which had been done in employment.

Reported Family Income / Yr	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65ys % (n/60)
<$30,000	22% (13)	42% (25)	25% (15)	38% (23)
$30,00-$45,000	28% (17)	28% (17)	30% (18)	27% (16)
>$45,00-$60,000	18% (11)	12% (7)	13% (8)	6% (10)
>$60,00-$75,000	10% (6)	7% (4)	12% (7)	5% (3)
>75,000	18% (11)	2% (1)	15% (9)	5% (3)
no response	3% (2)	10% (6)	5% (3)	8% (5)

Not surprisingly, men reported having higher family incomes ($U=1005$, $p<.001$) than women and younger people ($U=1217.5$, $p=.034$) reported having higher family incomes than their older counterparts.

Many of the subjects were involved in other activities outside of employment or homemaking. Thirty-two men (53%) and 37 women (62%) reported having `other' activities while 36 younger people (60%) and 33 older people (55%) reported having one or more `other' activities outside the home.

Other Activity	male %(n/32)	female %(n/37)	<65yrs %(n/36)	≥65ys %(n/33)
Caretaker for Children	0%	8%(5)	8%(5)	0%
Caretaker for Grandchildren	3%(2)	25%(9)	12%(7)	7%(4)
Volunteer Work	17%(10)	28%(17)	22%(13)	23%(14)
Caring for Ill Relative	2%(1)	7%(4)	5%(3)	3%(2)
Other (often church/politics)	47%(28)	27%(16)	33%(20)	40%(24)

There were no significant differences between genders or age groups as to whether the subjects had or did not have an `other' activity. However, a few differences existed between gender and age groups in the nature of activity; caring for children. More women than expected (statistically) or cared for children (Fisher's Exact Test, $p=.05$), cared for grandchildren ($\chi^2=4.90$,

p=.02). More men than expected had other pastimes, often related to church work or political work (χ^2=5.16, p=.02). More younger subjects than expected (statistically) cared for children (Fisher's Exact Test, p=.05).

Subjects were asked `What has prompted you to have cardiac surgery now?'. Responses were broadly categorized into three themes: length of time with symptoms, time waiting for surgery, and motivators for surgery. There were wide variations in the time that subjects reported waiting for surgery. Of those who discussed their waiting time for surgery, more than half were urgent inpatients. Nearly half of subjects who talked about motivators to have surgery, identified increasing limitations on their activities as the reason.

Preoperative Cardiac Status and Health History of Sample

NYHA Status (preoperative)	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
I	8% (5)	3% (2)	7% (4)	5% (3)
II	30% (18)	25% (15)	25% (15)	30% (18)
III	18% (11)	25% (15)	25% (15)	19% (11)
IV	44% (26)	45% (27)	43% (26)	46% (27)

There were no significant differences found between gender or age groups for NYHA status preoperatively (Mann-Whitney U, NS).

Risk factor identification for CAD was possible through review of subjects' medical records. Occasionally these data were not available in the medical record and two charts were not located. Included in the following table are descriptions of the risk factors possessed by those subjects who had CABG surgery or a combination of valve and CABG surgery.

Risk Factor	male % (n/58)	female % (n/41)	<65yrs % (n/51)	≥65yrs % (n/48)	missing % (n/99)
↑cholesterol	34% (20)	49% (20)	43% (22)	38% (18)	5% (6)
family hx CAD	31% (18)	53% (22)	45% (23)	35% (17)	6% (7)
hypertension	48% (28)	61% (25)	47% (24)	60% (29)	3% (3)
diabetes	17% (10)	20% (8)	18% (9)	19% (9)	3% (3)
current smoker	16% (9)	17% (7)	24% (12)	8% (4)	3% (3)

There were few significant differences between gender or age groups for having the identified risk factors. However, significant differences existed between gender groups (χ^2=5.47, p=.02) as more women than expected had a family history of CAD and between age groups (χ^2=4.41, p=.04) as more younger people than expected were current smokers.

Health History	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)	missing % (n/60)
Arthritis	14% (8)	19% (11)	9% (5)	23% (14)	3% (3)
Cancer	5% (3)	7% (4)	2% (1)	10% (6)	3% (3)
Cataracts	5% (3)	9% (5)	3% (2)	10% (6)	3% (3)
Other	42% (25)	54% (32)	38% (22)	58% (35)	3% (3)

There were no significant differences between gender or age groups for having the comorbidities arthritis (though approached significance for age groups χ^2=5.88, p=.053), cancer, or cataracts. Although there were no gender group differences for having `other' health problems, more older people than expected had `other' comorbidities (χ^2=6.33, p=.042).

Previous CAD History	male % (n/58)	female % (n/41)	<65yrs % (n/51)	≥65yrs % (n/48)	missing % (n/99)
MI	62% (36)	54% (21)	51% (26)	65% (31)	3% (3)
PTCA	22% (13)	12% (5)	20% (10)	17% (8)	3% (3)

Of those subjects who had CABG surgery or a combination of valve and CABG surgery, there were no significant differences between gender or age groups for having previous MI or PTCA.

Another risk factor for cardiac illness is obesity. Body mass index ($BMI=weight(kg)/height(m)^2$) was calculated based on the height and weights recorded on admission to hospital. Subjects were then categorized as being underweight, normal, marginally overweight, overweight, severely overweight, or being morbidly obese, using gender-based criteria. Again, there were some missing data (as indicated by `unknown').

Body Mass Index	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
Underweight	2% (1)	2% (1)	3% (2)	0%
Normal	28% (17)	27% (16)	20% (12)	35% (21)
Marginally Overweight	13% (8)	13% (8)	10% (6)	17% (10)
Overweight	25% (15)	20% (12)	23% (14)	22% (13)
Severely Overweight	23% (14)	20% (12)	27% (16)	17% (10)
Morbidly Obese	0%	2% (1)	2% (1)	0%
Unknown	8% (5)	17% (10)	15% (9)	10% (6)

There were no significant differences between gender or age groups for BMI.

Expected Benefits and Recovery of Having Cardiac Surgery

Subjects were asked to state whether they expected the following benefits from having cardiac surgery. This table represents a tabulation of the affirmative responses.

Expected Benefit of Surgery	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
Prolong Life	93% (56)	95% (57)	95% (57)	93% (56)
Resume Activities	82% (49)	95% (57)	90% (54)	87% (52)
Improve Life Quality	83% (50)	92% (55)	83% (50)	92% (55)
Travel	77% (46)	83% (50)	83% (50)	77% (46)

There were no significant differences in numbers of men and women who responded affirmatively to expecting to prolong their life, improve their life quality or to travel. However, there were significant differences between genders (χ^2=5.17, p=.023) for expecting to resume activities; more women than expected wanted to resume activities in which they currently could not engage. There were no significant differences between age groups' responses.

Subjects were given the opportunity to identify their own goal for having cardiac surgery. Seventy- three percent (87/120) of subjects identified at least one other goal. There were some obvious gender and age group differences in self-reported goals. Women more frequently reported having family related goals (men 8%, women 19%), and wanting to do more or increase their level of activity (men 14%, women 24%). Older people wanted to improve their level of activity more than younger subjects (<65yrs 14%, ≥65yrs 23%,), while younger people tended to want to return to work or social/recreational activities more frequently (<65yrs 34%, ≥65yrs 19%).

Subjects were asked to subjectively rate their expected recovery on a likert-type scale of zero to ten.

Expected Benefit of Surgery	male $\bar{x}$ (S.D.)	female $\bar{x}$ (S.D.)	<65yrs $\bar{x}$ (S.D.)	≥65yrs $\bar{x}$ (S.D.)
Expected Recovery	8.98 (1.13)	9.22 (1.15)	9.12 (1.17)	9.08 (1.12)

One-way ANOVA was used to determine if differences existed between gender and age groups in their expectations for recovery. There were no significant differences between gender or age groups for expected level of recovery.

Expected Primary Caregiver Characteristics

Subjects were asked questions about their expected primary caregiver, in an effort to make some inferences about differences in access to care giving between gender and age groups.

Expected Primary Caregiver	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
Spouse	93% (56)[1]	55% (33)[2]	78% (47)[3]	70% (42)[4]
Other Family (often daughter)	5% (3)	32% (19)	17% (10)	20% (12)
Other (most often homecare/unknown)	2% (1)	13% (8)	5% (3)	10% (6)

[1]100% (56/56) of those who reported having a spouse. [2]65% (33/46) of those who reported having a spouse. [3]85% (47/55) of those who reported having a spouse. [4] 89% (42/47) of those who reported having a spouse.

Fewer women (χ^2=23.38, p<.001) than expected thought their spouses would be their primary caregiver, while more than expected thought other family members would be their primary caregiver (primarily daughters), homecare services would be available, or they didn't know who would care for them postoperatively. There were no significant differences between age groups in who they expected their primary caregiver would be.

Employment Status of Expected Primary Caregivers	of males % (n/60)	of females % (n/60)	of <65yrs % (n/60)	of ≥65yrs % (n/60)
Employed	33% (20)	42% (25)	57% (34)	18% (11)
Not employed (most often homemaker)	37% (22)	12% (7)	18% (11)	30% (18)
Leave of Absence	2% (1)	5% (3)	3% (2)	3% (2)
Retired	27% (16)	33% (20)	18% (11)	42% (25)
Disability Pension	0%	3% (2)	2% (1)	2% (1)
Unknown	2% (1)	5% (3)	2% (1)	5% (3)

There were differences between genders for employment status of expected caregiver ($\chi^2=12.76$, $p<.026$). Fewer than expected of the men's primary caregivers were employed and more than expected of the women's primary caregivers were retired. There were also significant differences between age groups ($\chi^2=19.89$, $p<.001$). More of the younger people's caregivers than expected were employed outside of the home. In addition, fewer than expected of the younger people's caregivers were unemployed, and more of the older peoples caregivers than expected (statistically) were retired.

Nature of Expected Primary Caregivers Work	of males % (n/60)	of females % (n/60)	of <65yrs % (n/60)	of ≥65yrs % (n/60)
Professional	10% (6)	17% (10)	13% (8)	13% (8)
Administrative	10% (6)	8% (5)	8% (5)	10% (6)
Small business	3% (2)	10% (6)	10% (6)	3% (2)
Clerical	17% (10)	3% (2)	10% (6)	10% (6)
Skilled	12% (7)	32% (19)	27% (16)	17% (10)
Unskilled	5% (3)	2% (1)	3% (2)	3% (2)
Farming	3% (2)	12% (7)	8% (5)	7% (4)
Homemaking	37% (22)	8% (5)	15% (9)	30% (18)
Other/Unknown	3% (2)	8% (5)	5% (3)	7% (4)

There were significant between group differences ($\chi^2=29.78$, $p<.001$) in the

expected primary caregivers' employment status. More than expected of the men's caregivers, held lower status and homemaking positions, while more than expected of the women's caregivers held professional, small business and skilled positions. There were no significant differences between age groups for their primary caregivers' nature of work.

Health Status of Expected Primary Caregivers	of males % (n/60)	of females % (n/60)	of <65yrs % (n/60)	of ≥65yrs % (n/60)
Health problem	45% (27)	32% (19)	33% (20)	43% (26)
No health problem	53% (32)	63% (38)	65% (39)	52% (31)
Unknown	2% (1)	5% (3)	2% (1)	5% (3)

There were no significant differences between gender or age groups for the health status of their primary caregivers. Forty-six primary caregivers were identified as having a health problem. Thirty-seven percent of those caregivers' health problems were musculoskeletal (arthritis, back problems) and 35% were cardiovascular in nature. Other problems included debilitative chronic illnesses (multiple sclerosis, stroke patients), diabetes, current and former cancers, as well as gastrointestinal, renal, and mental health problems. There were no clear differences in nature of caregivers' health problems between age groups, however there were some differences between gender groups; 48% of men and 21% of women reported caregivers having musculoskeletal problems, while 53% of women and 22% of men reported caregivers having cardiovascular problems. Three of the women had husbands for whom they cared full time.

Baseline Data

A number of preoperative measures were taken for baseline data: current life quality, life satisfaction, perceived social support (Shortened Social Support Scale), functional status (Duke Activity Status Index) and health state (McMaster Health State Classification System). Life quality and life

satisfaction (in addition to perceived recovery) estimations by subjects were repeated at one month, two months and three months postoperatively. Social support, functional status and health state measures were repeated again at three months postoperatively.

Baseline Data (possible score range)	male x̄ (S.D.)	female x̄ (S.D.)	<65yrs x̄ (S.D.)	≥65yrs x̄ (S.D.)
Life Quality (0-10)	5.83 (2.53)	5.36 (3.11)	5.27 (2.53)	6.0 (2.31)
Life Satisfaction (0-10)	6.69 (2.48)	5.42 (2.36)	5.37 (2.88)	6.71 (2.74)
Social Support (0-20)	13.20 (3.05)	11.70 (2.97)	12.98 (2.93)	11.92 (3.02)
Functional Status (0-58.20)	24.04 (14.69)	18.17 (12.27)	21.98 (14.25)	20.23 (13.39)
Health State (-0.0207 to 1.00)	0.71 (0.16)	0.73 (0.14)	0.71 (0 .16)	0.73 (0 .14)

One-way ANOVA was used to determine if there were any differences between gender or age groups for life quality (gender NS; age NS), life satisfaction (gender $F(1,118)=6.68$, $p=.011$; age $F(1,118)=6.694$, $p=.011$), social support (gender $F(1,118)=7.88$, $p=.006$; age NS), functional status (gender $F(1,118)=5.63$, $p=.019$; age NS) and health state (gender NS; age NS). Thus, at baseline, men had higher life satisfaction scores than women, and older people had higher life satisfaction than younger people. In addition, men had more social support than women, and higher functional status (perhaps reflecting why women had a greater desire to return to activities--they had less functional capacity).

Correlates of Preoperative Measures

To further explore the relationships between variables measured in the

preoperative phase, correlations were run.

All Subjects

	age	educ	income	NYHA	BMI	QOL	satisfy	soc.sup	functn
educ	-.289 p=.001	NS							
income	NS	.212 p=.020							
NYHA	NS	NS	NS						
BMI	NS	-.215 p=.028	NS	NS					
QOL	NS	-.189 p=.040	-.214 p=.020	-.281 p=.002	NS				
satisfy	.196 p=.034	NS	NS	-.273 p=.003	NS	.573 p<.001			
soc.sup	-.205 p=.024	NS	NS	NS	NS	NS	NS		
functn	NS	NS	NS	-.287 p=.002	NS	.331 p<.001	.262 p=.004	NS	
health state	NS	NS	NS	-.642 p<.001	NS	.266 p=.003	NS	NS	.210 p=.022

Overall, there were some weak correlations noted between preoperative measures. As people aged, level of education was less (identified earlier in the sociodemographic factors), life satisfaction was higher, and social support was lower (there was not a statistically significant difference in social support between age groups). As level of education increased, income was higher, BMI was lower, and life quality was lower. Interestingly, as income improved, life quality decreased. As NYHA status deteriorated (score increased) life quality, life satisfaction, and functional status were poorer. With higher life quality were higher functional status and health state scores. Life satisfaction improved as functional status increased. In addition, those with higher functional status also had better health state scores. More moderate

correlations were noted between NYHA status and health state (as NYHA status worsened, health state deteriorated) as well as life quality and life satisfaction (as life quality improved, so did life satisfaction).

There were differences noted when correlates were explored for the separate gender and age groups (Appendix D). When the sample was divided for gender groups, there were noticeably fewer correlates of preoperative measures for men. A few weak correlations remained between age and education (as age increased, level of education was lower), and perceived life quality and health state (as perceived life quality improved, health state was higher). As with the total sample, more moderate correlations were noted between NYHA status and health state (as NYHA status worsened, health state deteriorated) and life quality and life satisfaction (as life quality improved, so did life satisfaction).

There were many more correlates of preoperative measures for women than men. As with the subject group as a whole, as women aged level of education was lower, but life satisfaction improved. As level of education increased and income improved, perceptions of life quality were lower. As NYHA status deteriorated (score increased) life quality and life satisfaction were poorer, and functional status and health state were also lower. Life quality was perceived as higher when functional status was higher. Perceived life satisfaction was also higher among those with higher functional status. Again, more moderate correlations were noted between NYHA status and health state (as NYHA status worsened, health state deteriorated) and life quality and life satisfaction (as life quality improved, so did life satisfaction).

Although there were fewer correlates of preoperative measures for the younger and older people when the sample was divided for age groups, the difference is not as noticeable as between genders. As these younger people

aged, their level of education was lower. Level of education was not correlated with any other variable. Again, as income increased perceived life quality decreased. As NYHA status deteriorated (score increased) life satisfaction was poorer, and functional status and health state (though with more moderate correlation) were also lower. Life quality was perceived as higher with higher rates of life satisfaction (more moderate correlation) and when functional status and health state were higher. Perceived life satisfaction was also higher among those with higher functional status. Again in the younger group, correlations were noted between functional status and health state.

There were several weak correlations in the older age group data. As age increased so did life satisfaction. As level of education and income were lower, BMI increased. As NYHA status worsened (score increased) life quality and life satisfaction were poorer, and health state (though with more moderate correlation) was lower. Life quality was higher with higher life satisfaction (with the highest level of correlation than any other grouping) and functional status was also higher. In contrast to the other correlate tables, as the older group of people aged, there was no correlation with level of education, perceived life satisfaction was not correlated with any other variable, and there were no correlations between functional status and health state.

In-hospital Events

Data were collected from medical records regarding in-hospital events. These data will be described here and may contribute to determining the influence of intra-hospital events on overall recovery. Here, type of surgery, complications, and length of stay are examined.

Type of Surgery	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)	total % (n/60)
CABG	95% (57)	60% (36)	82% (49)	73% (44)	78% (93)
Valve (single, double, triple)	3% (2)	32% (19)	15% (9)	20% (12)	17% (21)
Combination (valve/septal & CABG)	2% (1)	8% (5)	3% (2)	8% (5)	5% (6)

Women had less CABG and more valve surgery than expected statistically (χ^2=21.27, p<.001), while there were no significant differences in nature of surgical procedure between older and younger subjects.

The incidence of in-hospital complications in total was low, rendering meaningful statistical analysis regarding particular complications for gender or age groups, difficult. Thus, analysis was completed to determine whether there were differences between gender and age groups for having any complications.

In-Hospital Complication	Incidence
Cardiac Arrest	3
Deep Sternal Infection	4
GI Bleed	1
Heart Block (requiring permanent pacemaker)	1
Non-routine Mechanical Support	5
MI	3
Renal (requiring renal dialysis)	1
Stroke	3
Bleeding (requiring reoperation)	3

There were no significant differences between gender and age groups for incidence of any in-hospital complication.

Length of stay was determined from the medical record audit. If the subject spent more than twelve hours of one twenty-four hour period in an

environment, it was considered one day. Thus, if a subject had spent 36 hours in ICU, it was recorded as two days.

Location	male		female		<65yrs		≥65yrs	
	range (days)	x̄ (SD)	range (days)	x̄ (S.D.)	range (days)	x̄ (S.D.)	range (days)	x̄ (S.D.)
ICU	1-9	1.83 (1.69)	1-7	2.08 (1.59)	1-6	1.74 (1.31)	1-9	2.17 (1.90)
PostICU	2-36	6.29 (5.08)	2-16	6.29 (3.21)	2-36	6.00 (4.83)	2-22	6.57 (3.56)

Using one-way ANOVA to determine if there were any differences between gender or age groups for length of stay in ICU or postICU environments, no significant differences were found.

Recovery

Subjects were contacted by telephone at one, two, and three month periods postoperatively to obtain data regarding activities and social roles, cardiac rehabilitation attendance, smoking, symptoms and discomforts, health services use, support systems, NYHA status, perceptions of recovery, life quality, and life satisfaction. In addition, at three months postoperatively, data regarding whether expectations of cardiac surgery were met were also obtained. Descriptive findings will be presented separately for each of the monthly follow-up periods. Thereafter, a more integrated analysis will be presented.

One Month Postoperatively

At this time, 19 subjects did not participate in the follow-up interview. Thirteen subjects could not be located, and 6 subjects had postoperative complications (including wound infections and respiratory complications) which prevented them from participating. Available subjects (n=101) were asked if they had returned to activities and social roles in which they were

engaged preoperatively. In the following table, `possible n' is identified for each activity to clarify the number of subjects eligible (i.e. subjects who were not employed preoperatively were not included in description of subjects who returned to work postoperatively). There were no statistically significant differences between gender or age groups with regard to returning to normal activity, employment, other activity, or rehabilitation attendance. However, significantly more younger subjects continued to smoke than their older counterparts (Fisher's Exact Test, p=.05).

Postoperative Activities	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Normal Activity	11% (5/55)	9% (4/46)	8% (4/50)	10% (5/51)
Employment	0% (0/22)	0% (0/13)	0% (0/28)	0% (0/7)
Other Activities	18% (5/28)	10% (3/30)	10% (3/30)	18% (5/28)
Rehabilitation Attendance	2% (1/55)	0% (0/46)	2% (1/50)	0% (0/51)
Smoking	5% (3/55)	2% (1/46)	8% (4/50)	0% (0/51)

When given the opportunity to expand on their responses, subjects primarily reported that it was just too soon to return to employment or `other activities'. Reasons for not attending cardiac rehabilitation were much more varied. Between gender, groups obvious differences occurred with the following reports; not referred (men 12%, women 26%); physicians told them they didn't need (they were most often valve patients) it (men 0%, women 9%); and cardiac rehabilitation was not available to them due to their rural living (men, 20%, women 7%). Between age groups, obvious differences occurred with the following reports; it was too soon (<65yrs 9%, ≥65yrs 27%); not

been referred (<65yrs 11%, ≥65yrs 27%); and they were currently on waiting lists for cardiac rehabilitation (<65yrs 26%, ≥65yrs 9%).

At follow-up, subjects were asked about experience of cardiac symptoms (occurrence of angina) and discomforts related to surgical healing. New York Heart Association status was also assessed by telephone interview.

Symptoms and Discomforts	male %(n/possible n*)	female %(n/possible n*)	<65yrs %(n/possible n*)	≥65yrs %(n/possible n*)
Angina	4%(2/53)	19%(6/32)	7%(3/44)	12%(5/41)
Chest incision	69%(38/55)	78%(36/46)	74%(37/50)	73%(37/51)
Leg incision	57%(29/51)	61%(19/31)	68%(28/41)	53%(20/41)
Back soreness	42%(23/55)	52%(24/46)	44%(22/50)	50%(25/50)
Neck soreness	36%(20/55)	46%(21/46)	40%(20/50)	41%(21/51)
Swelling	25%(14/55)	9%(4/46)	20%(10/50)	16%(8/50)
SOB	29%(16/55)	50%(23/46)	54%(17/50)	43%(22/51)
-> preoperative	38%(6/16)	4%(1/23)	29%(5/17)	9%(2/22)
-< preoperative	56%(9/16)	83%(19/23)	65%(11/17)	77%(17/22)
-no change	6%(1/16)	13%(3/23)	6%(1/17)	14%(3/22)
NYHA--I	96%(53/55)	91%(41/45)	94%(47/50)	94%(47/50)
NYHA--II	4%(2/55)	7%(3/45)	6%(3/50)	4%(2/50)
NYHA--III	0%	2%(1/45)	0%	2%(1/50)
NYHA--IV	0%	0%	0%	0%

*reflecting either number of subjects interviewed or number of subjects to whom this question would apply (i.e. those who had leg incisions, or number of subjects who had CAD)

There were no significant differences between gender or age groups in incidence of most symptoms or discomforts. However, more women than expected reported angina (χ^2=5.24, p=.022) and SOB (χ^2=4.62, p=.032).

When subjects were asked to expand on the nature of their symptom or

discomfort (chest incision, leg incision, back pain, neck pain) they predominantly reported soreness and aches. Some gender and age group reporting differed with regard to chest incision infection (men 3%, women 17%; <65yrs 14%, ≥65yrs 6%); leg incision infection (<65yrs 57, ≥65yrs 15%); back (<65yrs 10%, ≥65yrs 35%) and neck pain (<65yrs 5%, ≥65yrs 44%) reportedly due to inactivity .

Subjects were also asked to respond to an open ended question concerning other discomforts or symptoms they may have experienced (not for which they were rehospitalized or saw a physician). They primarily described difficulty sleeping; persistent cough, sore throat or voice problems; and difficulty with mobility, soreness or control in their arms or hands. There were no differences between gender or age groups for nature of these problems.

Subjects were also asked about return for check up, to physician for new problems, rehospitalization, and use of home health services.

Use of Health Services	male %(n/55)	female %(n/46)	<65yrs %(n/50)	≥65yrs %(n/51)
Physician for Check-Up	98% (54)	98% (45)	100% (50)	96% (49)
Physician for New Problem	33% (18)	52% (24)	46% (23)	37% (19)
Rehospitalized	13% (7)	20% (9)	12% (6)	20% (10)
RN-Homecare	53% (29)	70% (32)	60% (30)	61% (31)

Though differences between gender groups in rates of rehospitalization approached significance, the only statistically significant difference occurred when more women than expected (χ^2=3.899 p=.048) sought help from a physician for a new problem during recovery (often leg incision problems).

There were no statistically significant differences found between age groups.

Subjects were also asked about their support systems at home; who were their sources of help and emotional support while at home. Data summarized on the following table is consistent with the earlier finding that women and older people were more often without a spouse and lived alone.

Most Helpful	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Spouse	88% (46/52)	63% (24/38)	75% (36/48)	90% (38/42)
Son	4% (2/55)	2% (1/46)	2% (1/50)	8% (4/51)
Daughter	4% (2/55)	22% (10/46)	12% (6/50)	10% (5/51)
Sibling	0%	2% (1/46)	2% (1/50)	0%
Friend	0%	0%	2% (1/50)	0%
Other	9% (5/55)	17% (8/46)	8% (4/50)	8% (4/51)
Unknown	0%	4% (2/46)	0%	0%

Most Emotional Support	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Spouse	92% (48/52)	68% (26/38)	71% (34/48)	87% (36/42)
Son	4% (2 /55)	7% (3/46)	0%	6% (3/51)
Daughter	4% (2/55)	20% (9/46)	10% (5/50)	14% (7/51)
Sibling	0%	2% (1/46)	2% (1/50)	0%
Friend	2% (1/55)	0%	0%	0%
Other	4% (2/55)	13% (6/46)	18% (9/50)	8% (4/51)
Unknown	0%	2% (1/46)	2% (1/50)	0%

More women than expected said their daughters were the most helpful, while fewer than expected said their spouses were most helpful (χ^2=15.59, p=.008). The same pattern occurred when asked about emotional support; more women than expected relied on their daughters and fewer relied on spouses (χ^2 =15.51, p=.017). There were no significant differences in age groups.

Subjects were then asked to comment on reasons why their identified

persons were most helpful. At this time, men and older people more frequently reported (men 48%, women 23%; <65yrs 30%, ≥65yrs 44%) their caregiver `takes care of me' as the reason why their caregiver had been so helpful. Women and younger subjects more frequently reported their caregiver `helps with MY work' (men 2%, women 44%; <65yrs 32%, ≥65yrs 18%).

As stated earlier, subjects were asked to rate their perceived recovery, life quality, and life satisfaction on a likert-type scale of zero to ten.

Perceptions at One Month Postop	male $\bar{x}$ (S.D.)	female $\bar{x}$ (S.D.)	<65yrs $\bar{x}$ (S.D.)	≥65yrs $\bar{x}$ (S.D.)
Recovery	6.11 (1.98)	5.98 (1.89)	5.71 (1.93)	6.37 (1.90)
Life Quality	6.75 (2.22)	6.74 (2.10)	6.78 (2.04)	6.71 (2.28)
Life Satisfaction	7.35 (2.16)	7.04 (2.13)	7.18 (2.20)	7.23 (2.11)

There were no statistically significant differences in gender or age groups in these perceptions at one month postoperatively.

Subjects were given the opportunity to provide reasons for their choice of score for these measures. Positive reasons for their choice for perceived recovery included subjects thought they were `improving' generally, `feeling great, normal', followed by `returning to some work around the home, housework'. More negative reasons for their choice for perceived recovery included `symptoms from other diseases remain', and `not doing usual activities'. Not surprisingly, more women (15%) than men (2%) reported returning to work around the home. The differences between age groups in reasons for reported scores were more frequent; more older subjects described `feeling great', their condition `improving' generally, or symptoms from some other concomitant disease processes persisted, while more younger subjects

described frustration at not being able to do usual activities.

Reasons subjects gave for their life quality and life satisfaction scores were not substantially different from those given for perceived recovery. However `having social support' was described as a component of life quality and life satisfaction, and included in reasons more often by women than men.

Correlates of Measures at One Month Postoperatively. To further explore relationships between variables at one month postoperatively, postoperative variables (NYHA status, perceived recovery, life quality, and life satisfaction), intra-hospital variable (length of hospital stay-- LOS), as well as preoperative and demographic variables (social support, functional status, health state, and age), were included in the correlations. As in the preoperative correlation tables, correlates were run for all subjects, men, women, subjects less than 65 years and subjects 65 years of age and older (Appendix E).

All Subjects

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	-.205 p=.024							
functn	NS	NS						
health state	NS	NS	.209 p=.022					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	-.255 p=.010	NS			
recov	NS	NS	.241 p=.015	NS	NS	NS		
QOL	NS	NS	NS	NS	NS	NS	.582 p<.001	
satisfy	NS	.228 p=.022	NS	NS	NS	NS	.656 p<.001	.705 p<.001

Overall, there are very few correlates of recovery at this time. Some correlates

at this time, were also found at the preoperative time. Some weak correlations were noted between preoperative functional status and health state and reported recovery; those with higher functional status and health state preoperatively, reported higher levels of recovery at one month postoperatively. Surprisingly, length of hospital stay and current NYHA status were not associated with any postoperative measures. There were moderate to high correlations between perceptions of recovery, life quality and life satisfaction.

There were fewer correlates of recovery for either gender or age group. For men, age had a weak association with life quality; as men aged life quality decreased. There were no correlations for men's preoperative functional status and one month postoperative measures. However, those men who scored higher on preoperative health state measure, had better (lower) NYHA status scores. As with the correlation matrix for all subjects, moderate correlations were noted between men's perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

Women's preoperative functional status was correlated with perception of recovery. There were no correlations between preoperative health state and any postoperative measures. As with men, but more strongly, correlations existed between women's perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

Only the younger subjects (<65yrs) demonstrated correlations between length of hospital stay and postoperative measures. As length of stay increased, perceived life quality decreased, and life satisfaction decreased. As with men, younger people demonstrated that their preoperative health state was correlated with postoperative NYHA status; those who scored higher in preoperative health state had better (lower) NYHA status scores postoperatively. In addition, those with poorer reported life quality also

reported poorer (higher) NYHA status scores. Consistently, correlations remained between perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

Age had more, though weak correlates for the older group of people than any other group. New York Heart Association status increased (worsened) as age increased, and life satisfaction also worsened with increasing age. Higher preoperative social support rendered higher postoperative life satisfaction scores. And with higher correlations than any other group, strong relationships existed between older people's perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

Two Months Postoperatively

At this time, more people could be contacted for follow-up interviews. Ten subjects did not participate in this interview as they could not be located. Available subjects (n=110) were again asked if they had returned to activities and social roles in which they were engaged preoperatively. Again, as at one month postoperatively, in the following table `possible n' is identified for each activity to clarify the number of subjects eligible (as there were missing cases) and those who might have returned to this activity (i.e. subjects who were not employed preoperatively were not included in description of percentage of subjects who returned to work postoperatively).

Postoperative Activities	male %(n/possible n)	female %(n/possible n)	<65yrs% (n/possible n)	≥65yrs %(n/possible n)
Normal Activity	47%(27/58)	37%(19/52)	42%(22/52)	41%(24/58)
Employment	29%(7/24)	25%(3/12)	75%(21/28)	38%(3/8)
Other Activities	42%(13/31)	33%(10/30)	43%(13/30)	32%(10/31)
Rehabilitation Attendance	26%(15/58)	15%(8/52)	28%(15/52)	14%(8/58)
Smoking	3%(2/58)	1%(1/52)	5%(3/52)	0%

Though the rough numbers indicate some differences between groups, the only statistically significant difference lay between age groups for rehabilitation attendance (χ^2=3.75, p=.05). Fewer older people than expected attended cardiac rehabilitation.

When given the opportunity to expand on their answers regarding return to employment and `other activities', the predominant reason remained that it was just too soon to do so. At this time, more men (32%) than women (15%) identified that they were on a waiting list for cardiac rehabilitation. In addition, 15% of women but no men reported their physicians told them they didn't need cardiac rehabilitation (again, these were more likely valve patients).

Subjects were again asked about symptoms and discomforts experienced. Generally, all subject groups experienced less symptoms and discomforts than at one month postoperatively.

Symptoms and Discomforts	male %(n/possible n*)	female %(n/possible n*)	<65yrs %(n/possible n*)	≥65yrs %(n/possible n*)
Angina	4% (2/56)	11%(4/36)	9%(4/46)	4%(2/46)
Chest incision	59%(34/58)	69%(36/52)	65%(34/52)	62%(36/58)
Leg incision	43%(23/54)	46%(16/35)	49%(21/43)	39%(18/46)
Back soreness	34%(20/58)	35%(18/52)	40%(21/52)	29%(17/58)
Neck soreness	28%(16/58)	25%(13/52)	33%(17/52)	21%(12/58)
Swelling	10%(6/58)	10%(5/52)	13%(7/52)	7%(4/58)
SOB	34%(20/58)	37%(19/52)	37%(19/52)	34%(20/58)
-> preoperative	15%(3/20)	11%(2/19)	21%(4/19)	5%(1/20)
-< preoperative	70%(14/20)	84%(16/19)	68%(13/19)	85%(17/20)
-no change	15%(3/20)	5% (1/19)	11%(2/19)	10%(2/20)
NYHA--I	93%(54/58)	90%(47/52)	88%(46/52)	95%(55/58)
NYHA--II	5%(3/58)	8%(4/52)	10%(5/52)	3%(2/58)
NYHA--III	2%(1/58)	2%(1/52)	2%(1/52)	2%(1/58)
NYHA--IV	0%	0%	0%	0%

* reflecting either number of subjects interviewed or number of subjects to whom this question would apply (i.e. those who had leg incisions, or number of subjects who had CAD)

Though at rates which were not statistically significant, fewer people than at one month postoperatively, reported that they enjoyed absence of cardiac symptoms. Although the other numbers reflect some subtle differences between gender and age groups for number of people who experienced these symptoms and discomforts, there were no statistically significant differences between the groups.

The nature of complaints changed little at this time. However of those subjects who reported chest incision difficulty, more older subjects than younger subjects reported having chest incision difficulty due to general

soreness and aching (<65yrs 58%, ≥65yrs 77%), and symptoms with activity (<65yrs 0%, ≥65yrs 23%). Older people also complained of more neck pain related to inactivity than the younger people (<65yrs 64%, ≥65yrs 92%).

Subjects were again asked to respond to an open ended question concerning any other discomforts or symptoms they may have experienced since their surgery (not including those problems for which they saw a physician or were rehospitalized). At this time, subjects complained primarily of memory loss; persistent cough, sore throat or voice problems; followed by difficulty with mobility, soreness or control in their arms or hands; joint pain; difficulty sleeping; and depression. There were no obvious differences between gender or age groups for these problems.

Except for returning for regularly scheduled checkups, rates at which subjects used health services declined from one month preoperatively. At this time, there were no statistically significant differences for gender or age groups in use of health services. However, there were some apparent distinctions between the gender and age groups in reasons for physician consultation. For example, more women reported having respiratory problems related to their surgery (women 26%, men 8%) and leg infections (women 11%, men 0%), while more men than women reported having chest infections (women 0%, men 23%). In addition, though more younger subjects reported having infection symptoms, more older subjects (<65yrs 0%, ≥65yrs 15%) consulted their physicians. Older subjects also reported more circulatory problems than their younger counterparts (<65yrs 0%, ≥65yrs 20%).

Use of Health Services	male % (n/58)	female % (n/52)	<65yrs % (n/52)	≥65yrs % (n/58)
Physician for Check-Up	98% (57)	94% (49)	96% (50)	97% (56)
Physician for New Problem	28% (16)	38% (20)	25% (13)	40% (23)
Rehospitalized	5% (3)	13% (7)	6% (3)	12% (7)
Homecare				
RN	14% (8)	19% (10)	15% (8)	17% (10)
Aide	0%	2% (1)	0%	2% (1)

Subjects were again asked about sources of help and emotional support. As earlier, data reflect that women and older people were more frequently without spouses and sought help from others.

Most Helpful	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Spouse	91% (49/54)	73% (29/40)	79% (38/48)	87% (40/46)
Son	5% (3/58)	6% (3/52)	6% (3/52)	5% (3/58)
Daughter	2% (1/58)	19% (10/52)	10% (5/52)	10% (6/58)
Sibling	0%	2% (1/52)	0%	2% (1/58)
Friend	0%	4% (2/52)	2% (1/52)	0%
Other	9% (5/58)	14% (7/52)	10% (5/52)	12% (7/58)

Most Emotional Support	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Spouse	93% (50/54)	73% (29/40)	81% (39/48)	87% (40/46)
Son	5% (3/58)	6% (3/52)	4% (2/52)	5% (3/58)
Daughter	2% (1/58)	19% (10/52)	10% (5/52)	14% (8/58)
Sibling	0%	2% (1/52)	0%	0%
Friend	2% (1/58)	4% (2/52)	0%	0%
Other	9% (5/58)	14% (7/52)	10% (5/52)	12% (7/58)

Differences between gender and age groups remained. More women than expected said their daughters were most helpful, and fewer had felt that spouses were most helpful (χ^2=15.54, p=.008). In addition, more women than expected relied on their daughters and fewer on spouses for emotional support (χ^2=18.81, p<.001). No statistically significant differences were found by age group.

At this time, men continued to frequently report feeling and appreciating being taken care of (men 38%, women 24%), and women appreciated being helped with what they perceived as `their work' (men 15%, women 29%). Older subjects tended to describe feelings of support and caring by their caregiver more frequently than the younger subjects (<65yrs 58%, ≥65yrs 66%).

Perceptions at Two Months Postop	male $\bar{x}$ (S.D.)	female $\bar{x}$ (S.D.)	<65yrs $\bar{x}$ (S.D.)	≥65yrs $\bar{x}$ (S.D.)
Recovery	7.57 (1.51)	7.36 (1.76)	7.15 (1.69)	7.76 (1.53)
Life Quality	7.79 (1.59)	7.49 (2.01)	7.43 (1.94)	7.84 (1.65)
Life Satisfaction	8.12 (1.72)	7.40 (2.28)	7.64 (2.03)	7.90 (2.04)

The only statistically significant difference was found between age groups in perceived recovery; older people perceived they had a greater recovery than their younger counterparts (F (1,109)=3.96, p=.049).

At this time, subjects' reasons for their perceived recovery, life quality, and life satisfaction scores reflected general improvement in their condition and pleasure. When citing reasons for their scores, women continued to report returning to some work around the home, and having social support more frequently than men. More men than women reported feeling `great', but also

feeling frustrated at not doing usual activities. Younger subjects more frequently than older subjects, reported frustration at not being able to engage in usual activities, and older subjects more frequently than their younger counterparts, identified `release from pain and worry' and having social support as reasons for their life quality scores.

Correlates of Measures at Two Months Postoperatively.

All Subjects

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	-.205 p=.024							
functn	NS	NS						
health state	NS	NS	.209 p=.022					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	NS	NS			
recov	NS	NS	.191 p=.045	NS	NS	-.313 p=.001		
QOL	NS	NS	.192 p=.044	NS	NS	-.232 p=.015	.740 p<.001	
satisfy	NS	NS	.219 p=.021	NS	NS	-.275 p=.004	.602 p<.001	.736 p<.001

Overall, there were more correlates of recovery at this time. Weak correlations were noted between preoperative functional status but not health state and reported recovery, life quality and life satisfaction; those with higher functional status preoperatively reported higher levels of recovery, life quality, and life satisfaction at two months postoperatively. Again, length of hospital stay was not associated with any postoperative measures. However, current NYHA status was now associated with reported recovery, life quality, and life

satisfaction. Moderate to high correlations remained between perceptions of recovery, life quality and life satisfaction.

Again, there were few correlates of recovery for either gender or age group (Appendix F). For men, age no longer had any association with postoperative variables, nor was their association between preoperative health state and any postoperative measures. However, there was now a weak correlation between preoperative functional status and life satisfaction. As with the correlation table for all subjects, moderate to strong correlations were noted between men's perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

Women had even fewer correlates at this time. No preoperative measures were correlated with postoperative status at this time. Current NYHA status, however was associated with perceptions of recovery, but not life quality or life satisfaction; as NYHA status scores increased (cardiac status worsened) perceptions of recovery worsened. As with men, there were moderate to strong correlations between women's perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

The younger subjects (<65yrs) no longer demonstrated correlations between preoperative health status or length of hospital stay and postoperative measures. As with men, younger people demonstrated that their preoperative functional status was correlated with postoperative life satisfaction. Younger folks also demonstrated a correlation between their postoperative NYHA status and perceptions of recovery, life quality, and life satisfaction; as NYHA score increased (worsened), ratings of recovery, life quality, and life satisfaction decreased. Consistently, and more so than at one month, fairly strong correlations remained between perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

For the older age group, preoperative perceived social support and functional status continued to have an influence. Those with higher preoperative social support scores and functional status scores reported higher ratings of recovery. No other correlates existed in this older group save for the expected correlations between perceived recovery, life quality, and life satisfaction. At this time, however, these correlations were consistently weaker than reported at one month postoperatively; perceptions of recovery and life quality, recovery and life satisfaction, and life quality and life satisfaction.

Three Months Postoperatively

All subjects (120: 60 men and 60 women) participated in the final interview. Questions posed to subjects at this time, included those from one and two month interviews as well as structured questions regarding attainment of their preoperative goals, and open ended questions encouraging reflection on the experience. Subjects were also asked to complete measures of social support, functional status, and health state to these scores might be compared with preoperative scores.

Postoperative Activities	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Normal Activity	73%(44/60)	53%(32/60)	63%(38/60)	60%(38/60)
Employment	48%(12/25)*	33%(5/15)	39%(13/33)*	57%(4/7)
Other Activities	50%(16/32)	60%(22/37)	50%(18/36)	61%(20/33)
Rehabilitation Attendance	37%(22/60)	30%(18/60)	40%(24/60)	27%(16/60)
Smoking	3%(2/60)	7%(4/60)	8%(5/60)	2%(1/60)

*Some men remained on leaves of absence or chose to retire from their positions

At three months postoperatively, a significant difference existed between genders and return to normal activity; fewer women than expected reported returning to their normal activity following surgery (χ^2=5.17, p=.023). Though the rough numbers indicate some differences between genders and age groups, no other statistically significant difference existed (including rehabilitation attendance).

When encouraged to give reasons for their responses to return to activities questions, although less frequently than in earlier months, subjects continued to report that it was `too soon' to return to employment. However, more frequently, subjects were identifying that they indeed felt `well enough' to do so. Interestingly 50% of employed men and only 8% of employed women reported feeling well enough to return to work. Reasons cited for the subjects' return to `other activities' responses followed suit; though less frequently than earlier months, `too soon' was still the most reported reason. However subjects also reported in increasing rates, that they were gradually increasing with their other activities, but still found they needed extra rest.

The predominant reason subjects stated for not attending cardiac rehabilitation was that it was not available to them. Women continued to report more frequently than men that they had either not been referred to cardiac rehabilitation (men 9%, women 20%) or their physicians had stated they didn't need rehabilitation services (men 3%, women 27%).

Subjects were asked about experiencing cardiac symptoms and discomforts related to their surgery.

Symptoms and Discomforts	male %(n/possible n*)	female %(n/possible n*)	<65yrs %(n/possible n*)	≥65yrs %(n/possible n*)
Angina	7%(4/58)	12%(5/41)	10%(5/51)	8%(4/48)
Chest incision	43%(26/60)	52%(31/60)	51%(31/60)	43%(26/60)
Leg incision	27%(15/56)	48%(19/40)	44%(21/48)	27%(13/48)
Back soreness	20%(12/60)	23%(14/60)	25%(15/60)	18%(11/60)
Neck soreness	12%(7)	22%(13/20)	17%(10/60)	17%(10/60)
Swelling	5%(3)	12%(7/60)	13%(8/60)	3%(2/60)
SOB	40%(24/60)	37%(22/60)	38%(23/60)	38%(23/60)
-> preoperative	8%(2/24)	9%(2/22)	9%(2/23)	9%(2/23)
-< preoperative	79%(19/24)	77%(17/22)	70%(16/23)	87%(20/23)
-no change	13%(3/24)	14%(3/22)	22%(5/23)	4%(1/23)
NYHA--I	92%(55/60)	90%(54/60)	92%(55/60)	90%(54/60)
NYHA--II	6%(4/60)	6%(4/60)	6%(4/60)	6%(4/60)
NYHA--III	2%(1/60)	2%(1/60)	0%	4%(2/60)
NYHA--IV	0%	2%(1/60)	1%(1/60)	0%

*reflecting either number of subjects interviewed or number of subjects to whom this question would apply (i.e. those who had leg incisions, or number of subjects who had CAD)

Symptoms and discomforts seemed to dissipate, though more women than expected experienced difficulties with leg incisions (χ^2=4.38, p=.036). There were no other statistically significant differences for symptoms and discomforts between gender or age groups. In addition there were no apparent differences between gender or age groups in the qualitative nature of symptoms reported.

Subjects were also given the opportunity to describe any other new discomfort or symptom experienced since their surgery (not incuding those for which they saw a physician or were rehospitalized). Subjects most frequently reported sleeping difficulty, shortness of breath, and depression, followed by

palpitations and vision problems. As time progressed, symptoms related to palpitations, depression, and vision were reported more frequently, though there were no clear differences between gender or age groups.

Use of Health Services	male % (n/60)	female % (n/60)	<65yrs % (n/60)	≥65yrs % (n/60)
Physician for Check-Up	93% (56)	93% (56)	92% (55)	95% (57)
Physician for New Problem	28% (17)	22% (13)	18% (11)	32% (19)
Rehospitalized	2% (1)	7% (4)	2% (1)	7% (4)
Homecare RN	7% (4)	15% (9)	12% (7)	10% (6)

Except for returning for regularly scheduled checkups, rates at which subjects used health services continued to decline. At three months postoperatively, there were no differences for gender or age groups in use of health services or the nature of problems which prompted them to seek health services.

Subjects were again asked about sources of support. Data in the following table continues to reflect that women and older people were often without a spouse and sought help from other family members. These data are roughly the same as those found at one and two months postoperatively.

Most Helpful	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Spouse	91%(52/56)	73% (33/46)	79% (44/55)	87% (41/47)
Son	3% (2/60)	2% (1/60)	0%	5% (3/60)
Daughter	5% (3/60)	23% (14/60)	13% (8/60)	15% (9/60)
Sibling	0%	0%	0%	0%
Friend	2% (1/60)	8% (5/60)	7% (4/60)	3% (2/60)
Other	3% (2/60)	12% (7/60)	7% (4/60)	8% (5/60)

Differences remained in roughly the same magnitude as at one and two months postoperatively. More women than expected said their daughters were most helpful, and fewer felt that spouses were most helpful (χ^2=17.14, p=.002). In addition, more women than expected relied on their daughters a fewer on spouses for emotional support (χ^2=16.62, p=.002). No statistically significant differences were found by age group.

Most Emotional Support	male %(n/possible n)	female %(n/possible n)	<65yrs %(n/possible n)	≥65yrs %(n/possible n)
Spouse	95% (53/56)	74% (34/46)	82% (45/55)	89% (42/47)
Son	0%	5% (3/60)	2% (1/60)	3% (2/60)
Daughter	3% (2/60)	20% (12/60)	12% (7/60)	12% (7/60)
Sibling	0%	0%	0%	0%
Friend	2% (1/60)	5% (3/60)	5% (3/60)	2% (1/60)
Other	7% (4/60)	13% (8/60)	7% (4/60)	13% (8/60)

Men (36%) continued to feel `taken care of' while women (12%) reported this even less frequently. Women reported appreciation of help with `their work' more frequently than earlier months and at a higher rate than men (men 12%, women 40%). Consistent with feeling `taken care of' over their recovery period, men reported feeling their caregiver was supportive more frequently than women (men 83%, women 53%), and consistent with feeling that their caregiver had helped with `their work' more women than men reported their caregiver was generally helpful (men 10%, women 37%). Again, age group differences reflected older subjects appreciating their caregivers activities more than younger subjects by reporting that the caregiver `takes care of me' (<65yrs 19%, ≥ 65yrs 30%); `helps me do MY work' (<65yrs 21%, ≥ 65yrs 32%); and is supportive and caring (<65yrs 66%, ≥ 65yrs 81%).

Subjects were asked to report again on perceived recovery, life quality, and life satisfaction. Measures of social support, functional status and health

state were also repeated at this time.

Perceptions at Three Months Postop	male x̄ (S.D.)	female x̄ (S.D.)	<65yrs x̄ (S.D.)	≥65yrs x̄ (S.D.)
Recovery (0-10)	7.57 (1.51)	7.36 (1.76)	7.90 (1.71)	8.15 (1.48)
Life Quality (0-10)	7.79 (1.59)	7.49 (2.01)	8.07 (1.76)	8.58 (1.31)
Life Satisfaction (0-10)	8.75 (1.15)	8.47 (1.76)	8.23 (1.73)	8.90 (1.14)
Social Support (0-20)	13.30 (3.01)	11.63 (2.86)	13.17 (3.28)	11.77 (2.63)
Functional Status (0-58.20)	30.53 (10.03)	27.04 (11.93)	30.35 (12.38)	27.22 (9.53)
Health State (-0.0207 to 1.00)	.90 (.08)	.89 (.07)	.89(.08)	.89 (.07)

There were no statistically significant differences found between gender groups. However, statistically significant differences were found between age groups in life satisfaction ($F(1,118)=4.66$, $p=.033$), with older people reporting higher life satisfaction scores, and social support ($F(1,118)=6.67$, $p=.011$) with older people reporting lower social support scores.

At this time, reasons for perceived recovery scores demonstrated little difference between gender or age groups. However, 3% of men and 43% of women reported retuning to work around the house as a contributor to their perceived recovery score. When considering life quality, more men than women reported frustration at not being able to do activities and lack of social support as, though more men than women reported that they were feeling quite well as their reason for quality of life score. Older subjects reported being generally happy more frequently than younger subjects (<65yrs 9%, ≥65yrs

24%) and older subjects reported having more difficulty due to bad weather than younger subjects (<65yrs 0%, ≥65yrs 9%). When providing reasons for their life satisfaction scores, men more frequently reported concern about their cardiac symptoms persisting (men 16%, women 2%), and more activity related to putting their life into perspective (men 14%, women 5%). However more women reported feeling well (men 18%, women 25%) and having social support (men 8%, women 16%) as reasons for their life satisfaction scores. Age group differences existed in reasons given for perceived life satisfaction scores: symptoms persisting (<65yrs 4%, ≥65yrs 13%); feeling great (<65yrs 33%, ≥65yrs 11%); feeling generally happy (<65yrs 63%, ≥65yrs 80%); feeling unhappy (<65yrs 22%, ≥65yrs 7%); and having social and family support (<65yrs 6%, ≥65yrs 19%).

Correlates of Measures at Three Months Postoperatively. To explore relationships between variables at three months postoperatively, current variables (NYHA status, recovery, life quality, life satisfaction, social support, functional status, and health state), an intra-hospital variable (LOS), preoperative variables (social support, functional status, and health state), and demographic variables (age, education, income, BMI) were entered into the multiple correlation.

All Subjects

	age	educ	income	BMI	so.sup1	so.sup2	fuctn1	fuctn2	hlthst 1	hlthst 2	NYHA	recov	QOL
educ	-.289 p=.001												
income	NS	.212 p=.020											
BMI	NS	-.215 p=.028	NS										
soc.sup 1	-.205 p=.024	NS	NS	NS									
soc.sup 2	-.337 p<.001	-.278 p=.002	.279 p=.002	NS	.578 p<.001								
fuctn 1	NS	NS	NS	NS	NS	NS							
fuctn 2	-.261 p=.004	NS	.287 p=.001	NS	NS	NS	.217 p=.017						
health state 1	NS	NS	NS	NS	NS	NS	.209 p=.022	NS					
health state 2	NS	NS	.234 p=.010	NS	NS	.222 p=.015	NS	.406 p<.001	.232 p=.011				
NYHA	NS	NS	NS	NS	NS	NS	NS	-.237 p=.009	NS	NS			
recov	NS	NS	NS	NS	.198 p=.030	NS	NS	.398 p<.001	NS	.551 p<.001	-.457 p<.001		
QOL	NS	NS	NS	NS	NS	NS	.277 p=.002	.371 p<.001	NS	.484 p<.001	-.339 p<.001	.724 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	NS	.375 p<.001	NS	.523 p<.001	-.284 p=.002	.683 p<.001	.828 p<.001

Correlates between variables at three months postoperatively were not markedly different from the preoperative interview or the previous recovering months. Age remained correlated with social support. As age increased, subjects perceived even less social support at three months postoperatively than at the preoperative time. At this time, age was also mildly associated with functional status; as age increased functional status was lower. Education was mildly correlated with age, income, BMI and life quality preoperatively. At three months postoperatively, education remained correlated with these variables (except for life quality), but was weakly correlated with social support. Level of education was lower in older people, income increased with higher levels of education, BMI was higher in those people with lower education, and people with lower levels of education reported more social support. Income was negatively associated with life quality preoperatively, but in the postoperative phase as income increased social support, functional status and health state were higher, and there was no association with life quality. Consistent with preoperative findings, BMI was not associated with any other variable. Not surprisingly, perceptions of social support preoperatively and postoperatively are correlated, but not as highly as what one might think. Only preoperative perception of social support was associated (though weakly) with current perceived recovery, while current perception of social support was not associated with perceived recovery. Social support scores at three months postoperatively were weakly associated with health state; those people with higher social support had higher health state scores. Functional status preoperatively was associated only mildly with functional status postoperatively, and with higher ratings of current perception of life quality. Higher postoperative functional status scores were associated with higher ratings of health state, better NYHA status scores (lower scores), higher

perceptions of recovery, life quality and life satisfaction. Improved postoperative health state scores were associated more moderately with higher perceptions of recovery, life quality, and life satisfaction. Length of hospital stay was not associated with any of the postoperative variables. Poorer reported NYHA status scores (higher scores) were associated with poorer perceived recovery, life quality, and life satisfaction. As found throughout the postoperative phase, higher perceived recovery scores were moderately associated with higher perceived life quality and life satisfaction scores, and higher life quality scores were more highly associated with higher life satisfaction scores.

Correlation matrices from three months postoperatively, for each gender and age group are located in Appendix G. For men, though there was no association between age and preoperative social support score, there was a weak association between age and postoperative social support score; as age increased perception of social support decreased. Income was not related to preoperative functional status, however as men's income rose, there was a weak association with postoperative functional status and current report of NYHA status. Men's BMI was not associated with any other variable. Again, social support scores preoperatively were not as highly associated as expected with postoperative social support scores. Higher perceptions of current recovery were weakly associated with higher preoperative social support scores. Higher postoperative social support was weakly associated with postoperative health state. Preoperative functional status was weakly associated with postoperative functional status and with improved life quality scores. Higher postoperative functional status scores were associated with higher postoperative health state scores, lower NYHA status scores (fewer cardiac symptoms), and higher subjective ratings of recovery, life quality, and life satisfaction. Preoperative

health state and postoperative health state were moderately correlated. Higher preoperative and postoperative health state scores had weak to moderate positive associations with subjective ratings of recovery, life quality, and life satisfaction. At three months following surgery, length of hospital stay was not associated with any postoperative variables. Lower NYHA status (fewer cardiac symptoms) were associated with higher perceptions of recovery and life satisfaction. Higher perceptions of recovery were moderately associated with higher life quality and life satisfaction scores and higher life quality scores were more highly associated with life satisfaction.

In comparison with women's preoperative scores correlations, there was no longer an association between age and life satisfaction. As women's age advanced, weak correlations existed with postoperative social support score and postoperative functional status; as age increased perception of social support and functional status decreased. However, as women's level of education improved, mild positive correlations existed with perceptions of social support and functional status. There were weak, positive correlations between income, and postoperative social support, functional status, and health state; as income increased, postoperative social support, functional status and health state improved. Women's BMI was not associated with any other variable. Other than being mildly associated with preoperative social support, postoperative social support was only mildly positively associated with postoperative functional status. Preoperative functional status was not associated with any postoperative variable, while postoperative functional status was mildly positively associated with postoperative health state, and perceptions of recovery, life quality and life satisfaction. Preoperative health state scores were not associated with any postoperative variable, while higher postoperative health state scores were also moderately associated with higher

perceptions of recovery, life quality, and life satisfaction. Length of hospital stay was not associated with any postoperative variables. Current rating of NYHA status was negatively associated with postoperative perceptions of recovery, life quality, and life satisfaction; as NYHA scores decreased (improved), perceptions of recovery, life quality, and life satisfaction improved. Again, as perceptions of recovery improved, moderate positive correlations were found with life quality and life satisfaction, and as life quality improved so did life satisfaction.

The younger subjects, also demonstrated an association between age, education and social support; as this groups' age increased, education level decreased and postoperative social support score decreased. Postoperative social support improved with increasing education in this age subject group. As income increased there was a mild positive association with postoperative social support and health state scores. Body Mass Index was not associated with any preoperative or postoperative variables for this age group. Postoperative social support was mildly associated with preoperative social support and with improved postoperative functional status, health state and perceptions of life quality. Postoperative functional status was positively associated with postoperative health state and perceptions of recovery, life quality, and life satisfaction. Postoperative health state was mildly to moderately associated with current reported NYHA status, and perceptions of recovery, life quality and life satisfaction; as health state scores improved NYHA scores declined (improved), and perceptions of recovery, life quality, and life satisfaction improved. When reported NYHA status improved (scores declined), subjects reported improved perceptions of recovery, life quality and life satisfaction; with moderate associations. Recovery was more highly and positively correlated with life quality and life satisfaction, and life quality

demonstrated an even higher positive correlation with life satisfaction.

In the older age group, age was also correlated with social support (as age increased social support decreased). In addition, age was correlated with functional status; as age decreased functional status decreased. This was the only group for which BMI was associated with any other variables. In the older subjects, BMI was mildly and negatively associated with education and income; BMI increased as level of education and income decreased. Interestingly, preoperative perceptions and not postoperative perceptions of social support were associated with current perceptions of recovery. Postoperative social support was, however associated mildly and positively with reported NYHA status. It appears that as older people reported more cardiac symptoms, they also reported having more social support. Preoperative and postoperative were mildly positively correlated. Postoperative functional status and postoperative health state, current NYHA status, perceived recovery and life satisfaction were mildly correlated; as functional status improved, health state improved, NYHA status improved (scores decreased), perceived recovery was higher, and life satisfaction was higher. Postoperative health state was associated with perceptions of recovery, life quality, and life satisfaction. Postoperative health state and perceived recovery were moderately correlated, while correlations between health state and life quality and life satisfaction were more weakly associated. Reported postoperative NYHA status was mildly associated with recovery; as NYHA status improved (scores decreased) perceived recovery improved. Again, as with the other groupings, perceptions of recovery were moderately correlated with life quality and life satisfaction, and life quality was correlated with life satisfaction.

Expected and Realized Benefits

At this time, subjects were also asked about having attained

preoperative goals. The sample size changes for the responses to these questions because some subjects did not identify these as goals preoperatively, subjects were not asked at the preoperative interview whether being free from pain and fatigue was a goal, and some subjects felt they could not answer the question.

Realized Benefit	male % (n/possible n)	female % (n/possible n)	<65yrs % (n/possible n)	≥65yrs % (n/possible n)
Prolong Life	100%(56/56)	88%(49/57)	91%(52/57)	96%(51/56)
Resume Former Activities	78%(38/49)	63%(36/57)	69%(37/54)	71%(37/52)
Improve Life Quality	92%(46/50)	84%(46/55)	86%(43/50)	89%(49/55)
Travel and Recreation	74%(34/46)	62%(31/50)	70%(35/50)	65%(30/46)
Freedom from Pain and Fatigue	73%(44/60)	67%(40/60)	72%(43/60)	68%(41/60)
Goal Stated Preoperatively	74%(37/50)	65%(24/37)	68%(30/44)	72%(31/43)

It is apparent that most people perceived that they realized benefits from having cardiac surgery. There were differences between genders however in perceptions of whether surgery had prolonged their life ($\chi^2=7.21$, $p=.007$); fewer women than expected felt surgery had prolonged their life. There were no differences between age groups in realizing expected benefits.

At three months postoperatively, subjects were asked `If you were to consider having surgery again, would you choose it?'.

	male % (n/possible n)	female % (n/possible n)	<65yrs % (n/possible n)	≥65yrs % (n/possible n)
Surgery Again	98%(54/55)	82%(46/56)	89%(50/56)	91%(50/55)
Satisfied with Decision	100%(59/59)	97%(58/60)	100%(60/60)	97%(57/59)

Statistical analysis revealed gender differences in responses to the question regarding whether subjects would choose to have surgery again. More women than expected said they would not choose surgery again (χ^2=9.12, p=.002). There were no statistically significant age group differences. At the time, subjects were given an opportunity to provide reasons for their response. The three most common reasons (which were generally positive reasons because most people said they would choose surgery again) included `only if absolutely necessary', `the outcome has been very good this time', and `feel rejuvenated'. Men more frequently reported pleasure with their surgical outcome (men 32%, women 21%), while women more frequently reported (men 4%, women 13%) that they felt much better postoperatively.

The subjects were also asked the question, `Are you satisfied with your decision to have surgery?'. Quantitative analysis of the response revealed there were no gender or age differences regarding overall satisfaction with subjects' decision to have cardiac surgery. However, there were a few differences in gender or age groups for reasons subjects gave for their responses to this question. Men and younger subjects more frequently reported that they didn't really feel they had a choice about having surgery--it was needed to survive (men 39%, women 34%; <65yrs 42%, ≥65yrs 31%). Older people more frequently included in their explanation that their physical condition before surgery had been very poor (<65yrs 27%, ≥65yrs 36%,).

When asked `What was particularly helpful/not helpful to you in your recovery from cardiac surgery?', 43% of subjects who went to cardiac rehabilitation reported that it was particularly helpful to them. Thereafter, subjects reported family and friends, health care staff generally, and of those who had homecare nurses 23% cited their help in particular. There were few gender or age differences in what subjects reported; women more frequently reported that family and friends were helpful (men 30%, women 45%), and men and younger subjects more frequently reported that cardiac rehabilitation was helpful (men 22%, women 14%; <65yrs 23%, ≥65yrs 13%).

Subjects were also asked the open ended question `What advice or recommendations would you give to others to assist them in their recovery from cardiac surgery?'. Most said `have a good attitude', followed by `help yourself--get moving/active', `listen to health care people--do what you're told', `have it done, encourage them', and `recognize your own limits--don't overdo'. There were some clear differences in the nature of advice offered between gender and age groups. For example, men and younger subjects more frequently suggested that patients should listen to health staff for instructions (men 29%, women 19%; <65yrs 31%, ≥65yrs 20%), and men more frequently advised recognizing own limitations as an important strategy in recovering from cardiac surgery (men 18%, women 10%). Older subjects often suggested that having a good attitude was important (<65yrs 21%, ≥65yrs 33%).

Summary of Changes Over Time

Return to Activities

Activities	One Month Postoperatively %(n/possible n)	Two Months Postoperatively %(n/possible n)	Three Months Postoperatively %(n/possible n)
Normal Activity	9% (9/101)	42% (46/110)	63% (76/120)
Employment	0%	28% (10/36)*	43% (17/40)*
Other Activities	14% (8/58)	38% (23/61)	56% (38/68)
Rehabilitation Attendance	1% (1/101)	21% (23/87)	33% (40/120)
Smoking	4% (4/101)	3% (3/110)	5% (6/120)

*Some men remained on leaves of absence or chose to retire from their positions

There were significant differences over time for number of subjects who reported returning to their normal activity (χ^2=68.27, p<.001), their employment (χ^2=19.17, p<.001), the `other' activities they reported having at the preoperative time (χ^2=24.17, p<.001), and attending cardiac rehabilitation (χ^2=37.04, p<.001). However there were no significant differences in the number of subjects who continued to smoke.

When the sample was divided into gender groups, trends for gender differences in return to activities remained over time. Though men reported returning to other activities and women reported returning to their employment in increasing numbers, differences between genders over time were not statistically significant. When the sample was divided into age groups, again most trends of return to activities remained over time. However, as expected there were no significant differences for the older age group in return to employment over time, likely because so few of them were employed.

Postoperative Symptoms and Discomforts (including NYHA status)

Symptoms and Discomforts	One Month Postoperatively %(n/possible n*)	Two Months Postoperatively %(n/possible n*)	Three Months Postoperatively %(n/possible n*)
Angina	9% (8/85)	8% (7/92)	9% (9/99)
Chest incision	73% (74/101)	64% (70/110)	48% (57/120)
Leg incision	59% (48/82)	44% (39/89)	35% (34/96)
Back soreness	47% (47/101)	35% (38/110)	22% (26/120)
Neck soreness	41% (41/101)	26% (29/110)	17% (20/120)
Swelling	18% (18/101)	10% (11/110)	8% (10/120)
SOB	39% (39/101)	36% (39/110)	38% (46/120)
-> preoperative	18% (7/39)	13% (5/39)	9% (4/46)
-< preoperative	72% (28/39)	77% (30/39)	78% (36/46)
-no change	10% (4/39)	10% (4/39)	13% (6/46)
NYHA--I	94% (94/100)	92% (101/110)	91% (109/120)
NYHA--II	5% (5/100)	6% (7/110)	7% (8/120)
NYHA--III	1% (1/100)	2% (2/110)	2% (2/120)
NYHA--IV			1% (1/120)

*reflecting either number of subjects interviewed or number of subjects to whom this question would apply (i.e. those who had leg incisions, or number of subjects who had CAD)

There was no significant change in subjects' reports of angina or NYHA status. Subjects' discomforts significantly improved over the follow-up period; chest incision discomfort (χ^2=15.85, p<.001), leg incision discomfort (χ^2=9.66, p=.008), back pain (χ^2=15.29, p<.001), neck pain (χ^2=15.91, p<.001), and swelling (χ^2=25.40, p<.001), all dissipated significantly over time. Shortness of breath and the nature of that SOB, did not change significantly over time.

When the sample was divided into gender groups, most trends of gender differences remained over time. Men and women had significant decreases in

symptoms related to chest incision, back, neck, and swelling discomforts. Men experienced significant improvement in leg incision discomfort while women did not. Neither group demonstrated improvement in SOB over time. When the sample was divided for age groups, both groups had significant decreases in chest incision, neck, swelling discomforts. Older subjects had significant decreases in back pain, while the younger subjects did not. Neither age group had significant improvements in their leg incisions or SOB symptoms.

Subjects were asked to respond to an open ended question concerning any other discomforts or symptoms they may have experienced since their surgery. The responses to this question did not include those problems for which subjects saw a physician or were rehospitalized.

New Problem Since Surgery	1 mos postop % (n/13)	2 mos postop % (n/14)	3 mos postop % (n/13)
memory loss	0%	29% (4)	0%
balance problems	0%	7% (1)	0%
palpitations	0%	7% (1)	15% (2)
joint pain	0%	14% (2)	0%
arm/hand mob./sore/control	15% (2)	14% (2)	8% (1)
headaches	8% (1)	7% (1)	0%
difficulty sleeping	31% (4)	14% (2)	23% (3)
SOB	8% (1)	7% (1)	23% (3)
GI problems	8% (1)	0%	0%
persistent cough/sore throat/voice problems	23% (3)	21% (3)	0%
ringing in ears	8% (1)	7% (1)	8% (1)
depression	0%	14% (2)	23% (3)
vision problems	0%	7% (1)	15% (2)

Over the three month follow-up, there were no obvious differences between gender or age groups in nature of other problems. However, some problems either persisted or worsened over the follow-up time. For example, early in the recovery period, subjects complained of headaches and persistent cough, sore throat, or voice problems. Throughout the three month follow-up, subjects fairly consistently reported having problems with their arms or hands related to mobility, soreness, or control; difficulty sleeping; shortness of breath; and ringing in their ears. As the recovery time progressed, more subjects reported palpitations, depression, and vision problems.

Use of Health Services

Use of Health Services	One Month Postoperatively % (n/101)	Two Months Postoperatively % (n/110)	Three Months Postoperatively % (n/120)
Physician for Check-Up	98% (99)	96% (106)	93% (112)
Physician for New Problem	42% (42)	33% (36)	25% (30)
Rehospitalized	16% (16)	9% (10)	4% (5)
Homecare RN	60% (61)	16% (18)	11% (13)

Over time, significantly fewer subjects saw physicians for a new problem (χ^2=6.86, p=.032), required rehospitalization (χ^2=8.82, p=.012), or used the services of a registered nurse for homecare (χ^2=79.64, p<.001).

The trends changed very little when the subjects were divided into gender groups. However, over the three month follow-up, men's reports of attending a physician for a new problem showed no significant difference, nor did women's rates of rehospitalization. Younger subjects shared a significant

decrease over time in seeing a physician for a new problem, and homecare use. Older subjects demonstrated no significant change in seeing a physician for a new problem, but shared decrease in rates of homecare use. Differences in rates of rehospitalization were not statistically significant.

Over the follow-up period, subjects reported slight changes in people they relied on, though consistently women thought daughters were most helpful and relied on them more for emotional support.

Most Helpful

Most Helpful	One Month Postoperatively		Two Months Postoperatively		Three Months Postoperatively	
	male %(n/55)	female %(n/46)	male %(n/58)	female %(n/52)	male %(n/60)	female %(n/60)
Spouse	84% (46/52)	55% (24/38)	85% (49/54)	56% (29/40)	87% (52/56)	73% (33/46)
Son	4%(2)	2%(1)	5%(3)	6%(3)	3%(2)	2%(1)
Daughter	4%(2)	23%(10)	2%(1)	19%(10)	5%(3)	23%(14)
Sibling	0%	3%(1)	0%	2%(1)	0%	0%
Friend	0%	0%	0%	4%(2)	2%(1)	8%(5)
Other	9%(5)	18%(8)	9%(5)	14%(7)	3%(2)	12%(7)

Most Emotional Support

Most Emotional Support	One Month Postoperatively		Two Months Postoperatively		Three Months Postoperatively	
	male %(n/55)	female %(n/46)	male %(n/58)	female %(n/52)	male %(n/60)	female %(n/60)
Spouse	93% (48/52)	68% (26/38)	93% (50/54)	73% (29/40)	95% (53/56)	74% (34/46)
Son	4%(2)	7%(3)	5%(3)	4%(2)	0%	5%(3)
Daughter	4%(2)	20%(9)	2%(1)	23%(12)	3%(2)	20%(12)
Sibling	0%	2%(1)	0%	0%	0%	0%
Friend	2%(1)	0%	0%	0%	2%(1)	5%(3)
Other	4%(2)	13%(6)	5%(3)	17%(9)	7%(4)	13%(8)

It has been apparent when viewing these data that men are more likely to have a spouse, and indeed rely on that spouse quite consistently through the postoperative period. Women are less likely to be married, and have a spouse to care for them. However, when comparisons were made between the percentages of men and women who have spouses, who then rely on those spouses for help, women choose their spouses less frequently than men. Women tend to look to their daughters or `others' for help. Those others often included homecare or rehabilitation nurses. Interestingly, women tended to look to their spouses more for emotional support than help.

Differences Between Preoperative and Three Months Postoperative Measures

Repeated measures ANOVA was used to determine if differences existed between preoperative and postoperative measures of expected and realized recovery, social support, functional status, and health state.

Expectation and Realization of Recovery. Repeated measures ANOVA was used to analyze the variables expectations for recovery and perceived

recovery (to determine if the preoperative goal for recovery was met). While there were no significant differences between gender or age groups, there were within-subject differences in the preoperative expectation and postoperative perception of recovery ($F(1)=41.26$, $p<.001$), indicating that subjects did not perceive their postoperative recovery met their preoperative expectations.

Social Support. Analysis for differences in social support from preoperative to postoperative phases revealed no significant difference between these times. However, over time gender group ($F=11.32$, $p=.001$) and age group ($F=6.62$, $p=.011$) differences for social support were revealed. Men and younger subjects reported having more social support than their group counterparts. These differences were not found in either of the less powerful tests done separately for preoperative and postoperative measurement of this variable.

Functional Status. There were significant overall differences in preoperative and postoperative functional status ($F=28.46$, $p<.001$) among subjects; functional status improved over time. Between gender differences ($F=7.26$, $p=.008$), but no between age group differences were revealed. Women had greater improvement in functional status than their male counterparts. Further analysis was done regarding functional status because it was noted during data entry that those with higher preoperative scores often had lower postoperative scores. Thus, the sample was divided into two groups; those with higher (median and higher--more likely men) and lower (below median--more likely women) preoperative scores. Repeated measures ANOVA were then run to determine if a difference existed between the high and low preoperative functional status scorers in their postoperative improvement. A significant difference existed between the improvement in preoperative high and low scorers ($F=18.58$, $p<.001$); people with low preoperative scores (more

likely women) improved significantly ($F=121.69$, $p<.001$) whereas people with high preoperative scores (more likely men) did not improve significantly.

Health State. When using repeated measures ANOVA to assess differences between preoperative and postoperative measures for health state there were significant within-subject differences found in health state over time ($F=151.40$, $p<.001$). Subjects' ratings of health state improved over time. However, there were no differences identified between gender or age groups in differences experienced over time.

Repeated Measures Analysis: Life Quality, Life Satisfaction, and Recovery

Repeated measures MANOVA was used to analyze the self-reported variables of recovery, life quality, and life satisfaction over the three month recovery period; and life quality and life satisfaction from the preoperative phase through the three month postoperative period. Thereafter, repeated measures ANOVA were run to determine with which variables differences existed.

Repeated measures MANOVA was used to analyze the differences between gender and age groups over the three month recovery time, for perceptions of recovery, life quality, and life satisfaction. Using the Wilks' criterion, the composite dependent variables were significantly affected by gender and age. There was a large ($ES=.066$) and significant effect ($F(3)=2.70$, $p=.049$) for gender on the composite of the three dependent variables. Males consistently reported higher composite scores than females. There was also a large ($ES=.070$) and significant effect age ($F(3)=2.87$, $p=.039$) on the composite dependent variable. Younger subjects (<65 yrs) consistently reported lower scores than the older subjects ($\geq$ 65 years). The interaction effect of gender by age group was not significant, perhaps due to the more moderate effect size ($ES=.038$) and insufficient power ($1-\beta=.39$) for

this analysis.

When looking at within-subjects effects (differences over time) there were significant changes in the composite scores ($F(6)=24.90$, $p<.001$; ES=.57; 1-β=1.00). There was no significant difference however, in response over time, between gender groups. Although the effect size was large (ES=.092), power was insufficient to find a difference (1-β=.67). There was a significant difference in the composite reported variables between age groups over time ($F(6)=2.38$, $p=.033$; ES=.114; 1-β=.80); older subjects demonstrating more improvement over time than younger subjects. No significant difference in the interaction of gender by age groups was found over time, though the effect size was moderate (ES=.053), there was insufficient power to find a difference (1-β=.39).

Univariate ANOVA was then used to determine in which variables the differences existed. When assessing between-group differences for life quality, differences were found only between gender groups ($F(1)=7.07$, $p=.009$; ES=.057; 1-β=.75). Though gender differences were never found for the variable of life quality at one month, two months, or three months postoperatively, they were revealed in the more powerful repeated measures analysis; with men reporting higher life quality scores than women. Differences between age groups and interaction effect of gender by age were not found; effect sizes were small and there was insufficient power. When looking at within-subjects effects there were significant changes in the sample's life quality scores over time ($F(2)=43.87$, $p<.001$; ES=.433; 1-β=1.00). Again, there were no significant differences between gender groups (ES=.011, 1-β=.16), age groups (ES=.018, 1-β= .23), or interaction of gender by age group (ES=.024, 1-β=.29) for improvement in life quality scores over time..

When assessing between-group differences for life satisfaction, no

differences were found between gender groups, age groups, or interaction of age by gender groups. Although age group differences were found for life satisfaction at three months postoperatively, when analyzed using the more omnibus statistical test over the three month period, this difference did not hold. When looking at within-subjects effects there were significant changes in the sample's life satisfaction scores over time ($F(2)=18.69$, $p<.001$; ES=.245; $1-\beta=1.00$). However, within-subject effects were not significantly different for gender groups (ES=.044, $1-\beta=.52$), age groups (ES=.012, $1-\beta= .17$), or interaction of gender by age group (ES=.008, $1-\beta=.13$).

When assessing between-group differences for recovery, differences were found only between age groups ($F(1)=7.03$, $p=.009$; ES=.057; $1-\beta=.75$). This finding with a more powerful repeated measures analysis, confirms the differences found at two months postoperatively, and extends the finding over the recovery period; older subjects report higher perceived recovery scores than younger subjects. Differences between gender groups and interaction effect of gender by age were not found; effect sizes were small and there was insufficient power. When looking at within-subjects effects there were significant changes in the sample's recovery scores over time ($F(2)=74.84$, $p<.001$; ES=.566; $1-\beta=1.00$). However, there were no significant differences between gender groups (ES=.044, $1-\beta=.51$), age groups (ES=.045, $1-\beta= .53$), or interaction of gender by age group (ES=.041, $1-\beta=.49$), for improvement in recovery scores over time.

Thus, repeated measures MANOVA analysis for the self report measures of recovery, life quality, and life satisfaction, indicates that over the three month period following cardiac surgery, gender and age grouping have a significant effect on the composite of the self-report scores. However, when the variables are analyzed independently with repeated measures ANOVA, the

separate measures used for perception of recovery, life quality and life satisfaction, though always demonstrating improvement over time, did not reveal any consistent distinctions between age or gender groups; there were between groups differences (overall) between age groups for recovery, gender group differences (overall) for life quality, and no gender or age group differences for life satisfaction.

Repeated measures MANOVA was also used to analyze the data for differences between gender and age groups from the preoperative interview through the three month recovery time, for the self-reported variables of life quality and life satisfaction. As in the MANOVA findings discussed earlier, the composite dependent variables were significantly affected by gender and age. There was a large (ES=.058) and significant effect ($F(2)=3.56$, $p=.032$) for gender on the composite of the two dependent variables. Males consistently reported higher composite scores than females. There was also a large (ES=.052) and significant effect age ($F(2)=3.17$, $p=.046$) on the composite dependent variable. Younger subjects (<65 yrs) consistently reported lower scores than the older subjects ($\geq$ 65 years). The interaction effect of gender by age group was not significant, perhaps due to the more moderate effect size (ES=.034) and insufficient power ($1-\beta=.41$) for this analysis.

When looking at within-subjects effects (differences over time) there were significant changes in the composite scores ($F(6)=29.80$, $p<.001$; ES=.617; $1-\beta=1.00$). There were no significant difference however, between gender or age groups over time. Although the effect size for gender was large (ES=.092), power was insufficient to find a difference ($1-\beta=.68$). The effect size for age groups was more moderate (ES=.044), and power was even lower ($1-\beta=.33$). No significant difference in the interaction of gender by age groups

was found over time, though the effect size was moderate (ES=.040), there was insufficient power to find a difference (1-β=.30).

Univariate ANOVA was then used to determine in which variables the differences existed. When assessing between-group differences for life quality, differences were found between both gender (F(1)=7.17, p=.008; ES=.058; 1-β=.75) and age groups (F(1)=4.14, p=.044; ES=.034; 1-β=.52). Although no significant gender or age group differences were found in reports of life quality preoperatively or throughout the postoperative phase, differences are revealed using a more powerful repeated measures analysis; men consistently reported higher life quality scores than women, and older subjects consistently reported higher life quality scores than younger subjects. An interaction effect of gender by age was not found; effect size was small and there was insufficient power. When looking at within-subjects effects there were significant changes in the sample's life quality scores over time (F(3)=56.51, p<.001; ES=.598; 1-β=1.00). However, there were no significant differences in improvement of life quality scores over time between gender groups (ES=.012, 1-β=.14), age groups (ES=.019, 1-β= .20), or interaction of gender by age group (ES=.035, 1-β=.35).

When assessing between-group differences for life satisfaction, differences were found between age groups (F(1)=6.13, p=.015; ES=.027; 1-β=.68), and for the interaction of gender by age (F(1)=3,95, p=.049; ES=.033; 1-β=.50) but not for gender groups. There were significant gender and age differences in reports of life satisfaction preoperatively (men reported higher scores than women and older subjects reported higher scores than younger subjects) and age group differences found at three months postoperatively (again, older subjects reported higher scores than younger subjects). The age group differences were reflected in the omnibus statistical

test over the preoperative and three month recovery period. When looking at within-subjects effects there were significant changes in the sample's perceived life satisfaction scores over time ($F(3)=32.69$, $p<.001$; ES=.462; $1-\beta=1.00$). However, differences between gender groups (ES=.063, $1-\beta=.62$), age groups (ES=.020, $1-\beta= .21$), or interaction of gender by age group(ES=.009, $1-\beta=.12$), for improvement in life satisfaction scores over time, were not significant.

Thus, when using repeated measures MANOVA for the self report measures of life quality and life satisfaction from the preoperative time through to three months postoperatively, gender and age grouping continued to have an overall effect on the composite of these scores. However, when reviewing within-subject analyses (over time), there were no differences between gender or age grouping in composite score differences over time. When these variables were analyzed independently with repeated measures ANOVA, significant overall differences remained between age groups for both variables and for gender groups in life quality only. In the analysis from the postoperative phase data only, differences between groups in the measure of life quality occurred only for gender. Including the preoperative phase data, expanded the differences to include differences in life quality measures between gender and age groups. There were no between group differences for life satisfaction, when this variable was assessed using only postoperative data. However, when the preoperative phase data were included age group differences and interaction of gender by age group differences were identified. Though life quality and life satisfaction reports continued to improve over time, there were no significant differences between either gender or age groups in this improvement.

Multiple Regression Analysis

Standard multiple regression was used to discover which of the preoperative, intraoperative, and postoperative factors uniquely influence recovery from cardiac surgery. Independent and dependent variables for these equations were carefully chosen with the help of the study's conceptual framework, the descriptive and correlational analyses described earlier, and the findings from the California cohort of women studied using much the same measures. Independent variables (factors) considered in the regression equations should correlate well with the dependent variable, but be less dependent on each other. For example, life quality and life satisfaction were always most highly correlated with each other, thus, only one of these variables, life quality was entered into the regression equation.

Perceived recovery, functional status, and health state were used as indictors of recovery (dependent variable), in the multiple regression equations because they were more often correlated with other variables throughout the recovery period. In addition, these variables represented a subjective measure, and objective measures of biophysical and biopsychosocial factors. Predictor variables included those measured at baseline including age, female gender, BMI category, NYHA status, and social support; from the intra-hospital phase, length of stay; from the postdischarge phase, rehabilitation attendance; and from the recovery phase, NYHA status, perception of life quality, functional status, and health state; all entered in the first step.

Female gender and rehabilitation attendance were dummy coded before entry (presence of female gender or rehabilitation attendance coded as 1; absence coded as 0). Thus, the B-weights for the dummy coded variables, female gender and rehabilitation attendance, would be multiplied by `one' in the multiple regression equations, rather than being multiplied by a real score

(as done with other factors). Although the subjects were sampled based on age category (<65years, ≥65years), the preference was to leave the age variable as `stated age' rather than `age category' to maintain variability.

Power analysis for the multiple regression equations was discussed earlier. Using the case to variable ratio of 10:1 as described in Tabachnick and Fidell (1989), attaining sufficient statistical power should be assured in these equations as there were 120 subjects in this sample and 10 independent variables (rendering a case to variable ratio of 12:1). However, power was still tested posthoc using another method (Cohen, 1987; as cited in Munro & Page, 1993).

$$N = \frac{L(1-R^2)}{R^2} + u + 1$$

Where: N= total sample size
L= effect size index
u= number of independent variables
R^2=desired effect

The effect size index (function of power and number of independent variables at a given alpha) was obtained from Cohen (1987); selecting power (0.80) and two-tailed alpha (0.05). A moderate effect size was chosen because a small effect would likely be less clinically significant.

$$N = \frac{16.8(1-0.13)}{0.13} + 10 + 1$$

$$N = 123$$

Where: N= total sample size
L= 16.8
u= 10
R^2= 0.13

Statistical power for these multiple regression analyses was therefore, just below the conventional 0.80, since 123 subjects would have been required. This renders the analysis with a slightly higher probability of not finding a

statistically significant finding.

	Perceived Recovery		Functional Status[3]		Health State[4]	
Predictor Variables	B-Weight	p=	B-Weight	p=	B-Weight	p=
Baseline:						
Age[1]	.196	NS	-.298	.007	-1.47^{-4}	NS
Female Gender[2]	.583	.004	-2.99	NS	.012	NS
BMI Category	.049	NS	-1.08	NS	-.007	NS
Social Support	.115	.001	-.201	NS	.002	NS
NYHA Status	-.089	NS	-.487	NS	-.009	NS
Intra-hospital:						
LOS	-.027	NS	-.228	NS	5.018^{-4}	NS
Postdischarge:						
Rehab Attendance[2]	.317	NS	-.456	NS	-.019	NS
Recovery:						
NYHA Status	-.717	.004	-2.07	NS	-.004	NS
Life Quality	.620	<.001	1.51	.043	.016	.002
Functional Status	.019	NS			.002	.029
Health State			31.77	.029		
Constant	.309	NS	20.61	NS	.763	<.001
R^2	.666		.307		.292	
Adjusted R^2	.631		.233		.216	
F(10,93)	18.58	<.001	4.13	<.001	3.84	<.001

[1]The regression equations were also run with age category. The significance of age as a predictor variable did not change. [2]Presence of factor coded 1, absence of factor coded 0. [3]Difference in functional status from preoperative to postoperative measure was also run as a dependent variable, resulting in loss of significant predictors. [4]Difference in health status from preoperative to postoperative measure was also run as a dependent variable, resulting in loss of significant predictors.

The predictor variables, as a group, did a much better job of explaining variance in perceived recovery (subjective measure) than in functional status or health state (objective measures). Nearly 67% of the unadjusted variance in perceived recovery at three months postoperatively was explained by these variables, while they helped to explain only 31% of the unadjusted variance for functional status and only 30% of the unadjusted variance for health state. In

all three cases, the overall regression was significant beyond the .001 level. Only current perceived life quality was a common predictor for all three dependent variables and neither female gender nor age were consistent significant predictors. Female gender, preoperative social support, current NYHA status, and life quality (postoperative functional status approached significance p=.058), made a significant contribution to perceived recovery. Thus women, and those with higher perceived social support preoperatively, and postoperative scores reflecting lower NYHA status (fewer cardiac symptoms) and higher perceptions of life quality tended to have perceptions of recovery which were higher.

Age, life quality, and health state were predictors of functional status at three months postoperatively; younger people, and those with higher current perceptions of life quality and health state scores tended to have higher functional status scores. Current life quality and functional status were the only predictors of health state at three months postoperatively; those with perceptions of higher life quality and higher functional status scores tended to have higher health state scores.

There were no variables measured at baseline which could consistently contribute to predicting outcome at the three month recovery period. Neither female gender nor age were consistent significant predictors of any of the measures of `recovery'; whether subjective (perceived recovery) or objective (functional status, health state). It is interesting to note that neither body mass index category, preoperative NYHA status, length of hospital stay, nor cardiac rehabilitation attendance were predictive of the recovery indicators either.

Throughout the process of having cardiac surgery, there were relatively few differences identified between the genders in this study and gender was not

helpful in consistently explaining variance in the regression equations. Findings from this study indicate that women were more functionally impaired, had less social support, and were less satisfied with their lives, but demonstrated significant improvement over the postoperative phase studied. The measure of recovery which was best predicted was not an `objective' measure but a `subjective' measure of recovery.

CHAPTER 5

Discussion

Over the decades in which issues related to gender in recovery from cardiac surgery have been studied, women have been understood to fare more poorly than men (Bolooki, et al., 1975; Loop, et al., 1983; Murdaugh & O'Rourke, 1988; Richardson & Cyrus, 1991; Shumaker & Czajkowski, 1993). Arguments have been made that a variety of factors contribute to women having more difficulty following cardiac surgery. These factors are primarily related to age; women are older than men when developing CAD (and are therefore older when referred for surgery); incidence of comorbidities increases with age, thus increasing surgical risk; morbidity and mortality from cardiac surgery increases with age (often due to poorer ventricular function); and women in particular are more economically disadvantaged and socially isolated as they age (Cosgrove, 1993; Craddock, Iyer, & Russell, 1994; Curtis, et al., 1994; Eaker, Kronmal, et al., 1989; Eaker, Packard, et al., 1989; Shumaker & Czajkowski, 1993; Wenger, 1989). However, there are also difficulties in diagnosing women's cardiac disease (including women's frequent atypical presentation, difficulties with diagnostic technology difficulties, and communication issues), and women's smaller hearts make the surgery more technically difficult (Arnstein, Buselli, & Rankin, 1996; Bickell, et al., 1992; Carey, et al., 1995; Glazer & Hurst, 1987; Khan, et al., 1990; Loop et al., 1983; Richardson & Cyrus, 1991; Tobin, et al., 1987; Wenger, 1990).

Not as well explored, are issues related to how `good' recovery has been defined and operationalized in studies of cardiac surgery recovery and if indeed, factors which contribute to recovery differ between genders or with age. Given the multidimensional nature of recovery from cardiac surgery, limiting examination of `recovery' to the traditions of citing objective

morbidity data, and health care costs, is illogical. Yet, despite early evidence (Blacher, 1987; Gortner, Gilliss, Shinn, et al, 1988; Jenkins et al.,1983; Kimball, 1969a,b; Powers, 1968) that subjective perceptions and psychosocial factors are significant contributors to people's sense of well-being, limiting `recovery' to traditions of objectification has been common practice. Over time, however, psychosocial aspects of patient's lives have become the focus in research related to cardiac surgery. From that focus, there has been increasing evidence that women in particular, consider their unique and multiple economic, social, and familial roles, as well as their connections and relationships with others, when describing their recovery from cardiac surgery (Hawthorne, 1993; King & Gortner, 1996; King & Jensen, 1994; Parchert & Creason, 1989; Penckofer & Holm, 1990; Shumaker & Czajkowski, 1993; Wenger, et al., 1993). More recently, research convictions and methodology are becoming more complex; encouraging and facilitating consideration of multiple facets of single phenomena of interest--a biopsychosocial perspective (King & Gortner, 1996; King, Porter, Norsen, & Reis, 1992; King, Porter & Rowe, 1994).

The purpose of this study was to examine the effect of gender and age on recovery from cardiac surgery, from a biopsychosocial perspective. Gender was the primary variable of interest, however, recognizing the linkage between gender and age (women are usually older when presenting for cardiac surgery), and inherent difficulties in making gender comparisons without consideration of age differences, age clearly needed to be considered. Sampling subjects by gender and age stratification enabled some clearer comparisons to be made between gender and age groups. In addition, with an understanding of the multidimensional nature of recovery from cardiac surgery (as depicted in the study's conceptual framework), relationships between biophysical and

psychosocial factors thought to influence recovery, as well as predictors and outcome measures of cardiac surgery recovery were examined. To summarize the findings of this study and place them in the context of current research, the discussion will be guided by the original research questions and study hypothesis. Thereafter, issues related to operationalization of recovery, study limitations, and recommendations for further research will be discussed.

The Influence of Gender and Age on Cardiac Surgery Recovery

Preoperative Phase

Baseline Cardiac Status and Risk Factors. Ninety-three percent of subjects entered hospital with cardiac symptoms of NYHA class II or above. Overweight was the most commonly reported cardiac risk factor, followed by hypertension, family history of CAD, elevated cholesterol, diabetes, current smoking, and previous MI or angioplasty. Overweight, was assessed by calculating BMI with appropriate gender-based formulas. Of those subjects for which BMI could be calculated (105/120), nearly 70% were considered overweight. There were no statistically significant differences between gender or age groups with regard to severity of cardiac symptoms (NYHA class), overweight, hypertension, elevated cholesterol, and diabetes for those subjects who had CABG or a combination of CABG and valve surgery. However, there were differences between genders in having a family history of CAD; women had a significantly higher rate of having a family history of CAD than men. Though women and older people are generally understood to be more functionally impaired and have a higher incidence of hypertension, heart failure, and diabetes when presenting for surgery (Cosgrove, 1993; Eaker, et al., 1989; Kennedy, et al., 1981; Khan, et al., 1990; King, Clark, & Hicks, 1992; Loop, et al., 1983; Steingart, et al., 1991), this was not the trend with this particular sample.

In this study total sample, 15% of men and 18% of women reported being current smokers; higher than the 3% of men and 6.4% of women reported as preoperative smokers by Artinian & Duggan (1995), but lower than the 63% of women and 51% of men reported by Steingart, et al. (1991), and Health Canada's (1994) reports of national smoking rates (26% of men, 29% of women). The gender differences in our study sample were not statistically significant. However, smoking was significantly more frequent in the younger age group (27% in subjects less than 65 years, and 7% in subjects 65 years of age and older). This is consistent with other cardiac surgery study findings (Peigh, et al., 1994), as well as risk factor identification data (Heart and Stroke Foundation of Canada, 1996).

Though not considered a important risk factor for cardiac surgery (Gohlke, Betz, & Roskamm, 1988), when considering all subjects, our findings were similar to those of Rankin (1990); significantly more men than women had a history of having previous MI or angioplasty. However, when history of previous MI or angioplasty were considered only for those having CABG or a combination of CABG and valve surgery, there were no significant differences between genders or age groups. Finally, comorbidities were frequently reported. Though no gender or age group differences existed for common comorbidities, consistent with current understanding (King, Clark, Norsen, & Hicks, 1992; Peigh, et al., 1994), older subjects had significantly more `other' health problems than their younger counterparts when entering hospital for surgery.

Social Characteristics and Support. Consistent with current literature, our study findings indicate that women and older people were more socially and economically disadvantaged. Although most subjects lived with a spouse, not surprisingly (Artinian & Duggan, 1995; King, et al., 1994; Moore, 1995; Varvaro, 1993), women and older people more frequently lived alone. Though

93% of men and 77% of women reported living with a spouse, when asked `Who will be the primary person helping you when discharged from hospital?', all married men but only 65% of married women reported their spouse was expected to be their primary caregiver postoperatively. There were no statistically significant differences between older and younger groups in who the expected primary caregiver would be. Thirty-two percent of women and only 5% of men expected that other family members (other than spouse) would care for them; these caregivers were usually daughters. Whereas 13% of women and only 2% of men reported expecting some `other' (more often homecare or unknown) source of caregiving postoperatively.

The study data revealed that fewer mens and more womens expected primary caregivers were employed and fewer men's and more women's expected primary caregivers were retired. For age group differences, more of the younger subjects' and fewer of the older subjects' expected primary caregivers were employed. These findings are consistent with the notion that men would be married to homemakers, women would have spouses or daughters who would be working, and younger subjects would have spouses or caregivers who are employed while older subjects' caregivers would likely be retired also. Though the notion exists that daughters who work outside the home take leaves of absences to care for their mothers and other family members, our data do not support this inference.

There were no significant gender or age group differences for the health status of their expected primary caregiver, which is surprising because health problems should increase with age. However, three of the women in this study had husbands with chronic debilitative illnesses, for whom they cared full time.

At this time, men reported having significantly more social support than

women (as indicated by the Shortened Social Support Scale). This is consistent with some current evidence regarding gender and social support (Berkman, Vaccarino, & Seeman, 1993; Moore, 1995; Shumaker & Hill, 1991). There were no differences in social support between age groups, despite a weak negative correlation between age and social support (r=-.205). Again, older people were more likely to be widowed.

Men and younger subjects reported having higher family incomes and being actively employed. In addition, men held higher status jobs than women who were employed. Women, on the other hand, tended to engage in other activities related to caregiving of children, grandchildren, or ill relatives more frequently than their male counterparts; activities not generally recognized as `work', or for which remuneration is common. Findings indicated that only older people, and not women (which is more common) had less in school years than younger subjects.

Expectations, Functional Status, and Health State. When subjects were asked about expected benefits of having cardiac surgery, most agreed that they hoped it would prolong their life, they could resume activities in which they currently could not engage, improve life quality, and travel. Significantly more women than men hoped that having cardiac surgery would enable them to resume activities in which they currently could not engage. Interestingly, women also had significantly lower preoperative scores for functional status (measured by the Duke Activity Status Index) than men, affirming functional impairment and hence women's desire to improve function postoperatively. There were no significant age group differences for functional status scores or significant correlations of age with functional status, at this time. Although counterintuitive, this finding is consistent with others in this study; there were no age group differences in NYHA status or comorbidities such as arthritis,

both of which would limit functional status.

Subjects were also asked about their goals for cardiac surgical recovery. Despite women's lower scores in functional status, and older subjects tending to have more other health problems, neither the women nor the older subjects had significantly lower expectations for their recovery than their group counterparts, nor were there significant gender or age group differences for health-related quality of life. The McMaster Health State Classification System was used to measure of health-related quality of life. It was used as a more broad indicator of psychosocial well being, including multiple components of health; sensation, mobility, emotion, cognition, self-care and pain. There were no significant gender or age group differences for scores on the McMaster Health State Classification System and these scores were not significantly correlated with age. Scores for this measure were moderately correlated with NYHA class; for which there were no gender or age group differences either.

Life Quality and Life Satisfaction. At the preoperative phase, subjects were also asked to rate their current life quality and life satisfaction. There were no significant differences in life quality for gender or age groups, however men and older subjects had significantly higher life satisfaction scores than their group counterparts. Perhaps women were less satisfied due to their concerns with impairment in function. On the other hand, older subjects were perhaps more resilient, or perceived their situation as more `normal' than the younger groups (Rankin, 1990; Varvaro, 1993; Wagnild & Young, 1990).

Summary. Collection of baseline data was a particularly important component of this study. A sound foundation of baseline data was required to provide an understanding of subjects' states before entering cardiac surgery so that changes noted over the postoperative period could be placed within a

meaningful context.

Subjects entered the process of having cardiac surgery from a different point of view or place; differing in some respects by gender and age. Women in this study were not at a particular disadvantage with respect to cardiac status and risk factors. However, women were poorer, were more likely not employed, had more caregiving responsibilities, were more functionally impaired, and had less social support and lower perceived life satisfaction scores. Though older subjects had many of the same characteristics, older people were more satisfied with their lives. So from the outset, subject groups demonstrated some clear and statistically significant differences which had the potential to influence or cloud the entire cardiac surgery process.

Intra-hospital Phase

Though there were no differences in nature of surgery between age groups, significantly fewer women than men had coronary artery revascularization and more women than men had valve surgery. The gender differences in nature of cardiac surgical procedure, found in this study's sample, reflect the trends of only 20-30% of CABG surgery and nearly 50% of valve surgery being performed on women (American Heart Association, 1996; Heart and Stroke Foundation of Canada, 1996). In hospital operative complications were infrequent and did not occur more consistently in one gender or age group over another.

Only two patients died during their hospitalization; one man and one woman. The operative mortality rate for coronary artery revascularization surgery is generally in the range of 3-5% (Jaglal, Tu, & Naylor, 1995), and for valvular heart disease is 1-6%, depending on the degree of left ventricular dysfunction (Gray & Helfant, 1989). Thus, for this sample, operative mortality was quite low. Since the study sample did not include those patients

requiring emergent surgery (i.e. following unsuccessful PTCA) or those who were medically unstable and waiting for surgery in an intensive care unit, it is reasonable to expect that the operative mortality for this group would be better than the cardiac surgical population at large.

In addition, the sampling strategy for this study arbitrarily set no statistically significant age difference between men and women, as well as a slightly lower mean age for women and higher mean age for men than in the general cardiac surgical population. The mean age for men in this study was 62.9 yrs (SD 9.89) and for women was 62.93 yrs (SD 10.05). Cosgrove (1993) reported that CASS (7,860 CABG patients) data revealed a statistically significant difference in age between the genders; women were significantly older than the men (mean age of males was approximately 59 yrs, females as 64 yrs). In a study of 5,175 CABG patients, Jaglal, et al. (1995) reported that men were, on average, three years younger than females (mean age of males 61.2 yrs, females 64.2 yrs).

Total length of hospital stay was not calculated, only length of ICU and postICU stays were calculated. This decision was made to control for differences in hospitals' policies/procedures regarding keeping patients in-house or at other institutions while awaiting surgery and their differing discharge practices (the Edmonton institution had adopted procedures which rendered an earlier discharge than the Calgary institutions), postICU stay was calculated. If postoperative complications existed, postICU stay would be extended despite hospital policy and procedure. Thus gender and age group differences could still be appropriately examined. In fact, there were no gender or age group differences in this sample for length of ICU or postICU stay. Women and older subjects are often more ill postoperatively, requiring longer ICU and hospital stays (Craddock, et al., 1994; King, Clark, Norsen, & Hicks,

1992; Peigh, et al., 1994; Rankin, 1990). However, this subject group did not follow that trend.

Thus, in this study sample, the nature of surgery was consistent with the cardiac surgical population at large, and in hospital events were not affected by either gender or age.

Recovery Over Three Month Follow-Up

Return to Activities. Over the three months in which patients were followed, men and women gradually returned to their normal activities, to employment, and other identified activities. Interestingly, at three months postoperatively, though 73% of men reported being back to their normal activity, they did not return to work or `other' activities at the same rate. However, though only 53% of women reported being back to their normal activity, they had returned to employment or `other activities' (which were predominantly caring for others), at an even higher rate. This finding provides more evidence to an already growing body of knowledge which indicates that women return to other role related functions at a higher rate than their male counterparts (Low, 1993; Parchert & Creason, 1989; Penckofer & Holm, 1990). When the sample was divided into age groups, again most trends of return to activities remained over time, but there were no differences between age groups. As expected, however, there were no significant differences for the older age group in return to employment over time, likely because so few of them were employed.

As expected (Cardiac Rehabilitation Guideline Panel, 1995; DeBusk, 1992; Garriker, Goins, & Dennis, 1992; King & Jenkins, 1996), few subjects attended cardiac rehabilitation; only one third. What was surprising was the split was approximately one third of each gender and there were no statistically significant differences between gender or age groups. Despite evidence that

patients who have valve surgery can benefit from having attending cardiac rehabilitation programs (Greenland & Chu, 1988; Balady, et al., 1994; Garriker, Goins, & Dennis, 1992), no patients from our study who had valve surgery identified that they had been referred to a cardiac rehabilitation program. So proportionately more women than men who had bypass surgery were referred and attended cardiac rehabilitation. These findings are surprising as they are contrary to what is often found in the literature; usually more men and younger people are referred, attend and complete cardiac rehabilitation programs despite evidence that to suggest that women and the elderly may also benefit from such programs (Ades, Waldmann, & Gillespie, 1995; Ades, Waldmann, Polk, & Coflesky, 1992; Cannistra, Balady, O'Malley, Weiner, & Ryan, 1992; Cardiac Rehabilitation Guideline Panel, 1995; Lavie & Milani, 1995a,b; Low, 1993).

There were relatively few people who reported smoking preoperatively (17%) and even fewer who continued to smoke at three months postoperatively (.05%). Changes in smoking status did not change over the recovery period; once subjects quit at the time of surgery, very few started smoking again within the three month follow-up. Though not statistically significant, more younger people than older continued to smoke.

In summary, although all subjects returned gradually to their normal activity, work, and `other' activities, the rate of return was affected more by gender than by age; rehabilitation attendance was not affected by age or gender; and although very few subjects continued to smoke, smoking status was affected more by age than gender.

Symptoms and Discomforts. Over the three month follow-up period, subjects were asked to report about symptoms and discomforts related to their heart disease and cardiac surgery recovery. Although there was significant

improvement in NYHA status from the preoperative to postoperative time, subjects' reports of having angina did not change significantly over the three month follow-up, and not surprisingly neither did self-reported NYHA status.

Discomforts related to chest incisions, leg incisions, back and neck pain, and swelling were common and dissipated significantly over time. Other complaints of discomforts experienced by subjects included headaches and persistent cough, sore throat, or voice problems (possibly related to intubation). Throughout the three month follow-up, subjects rather consistently reported having problems with their arms or hands related to mobility, soreness, or control; difficulty sleeping; shortness of breath; and ringing in their ears. As the recovery time progressed, more subjects reported palpitations, depression, and vision problems.

Several authors have identified common symptoms and discomforts associated with cardiac surgical recovery over a three week to six month follow-up period (Hawthorne, 1994; Heye, 1991; Jaarsma, Kastermans, Dassen, & Philipsen, 1995; King & Parrinello, 1988; Moore, 1994, 1995; Tack and Gilliss, 1990; Wu, 1995). Pain and discomfort from sternal incision, leg incision, in the back and neck, as well as swelling have been reported frequently in the literature (Heye, 1991; King & Parrinello, 1988; Moore, 1994, 1995; Tack & Gilliss, 1990; Wu, 1995). In a particularly detailed explanation of sources of pain and discomfort following CABG surgery, Heye (1991) reported that it is common for patients to experience pain in the sternum, arms, legs, chest wall, upper back, and between the shoulder blades. In addition, sensations such as numbness, tingling, and tightness are also common, particularly at leg incisions cites. The incisional pain was thought to decrease significantly over 8 weeks, but sensitivity in the chest and leg might actually increase over that period. However, Heye explains that the majority of

patients' pain resolves within a 12 week period. Heye also explains the sources for some of the discomforts experienced by patients post-thoracotomy. Shoulder and upper arm pain can be related to brachial plexus injury due to expansion of the chest wall, while hand and finger pain or numbness and tingling can result from ulnar nerve injury due to compression at the elbow during surgery.

Difficulties with sleep disruption, cough, palpitations, and depression have been commonly reported in the earlier phases (up to eight weeks following) of cardiac surgery recovery (King & Parrinello, 1988; Moore, 1994; Tack & Gilliss; Wu, 1995). Thereafter, difficulties with sleeping, depression, and shortness of breath have been found to persist (Jaarsma, et al., 1995).

When the sample was divided into gender groups, both men and women were found to have significant decreases in symptoms related to chest incision, back, neck, and swelling discomforts over the three month follow-up. Yet, the number of men who complained of having angina actually increased over the follow-up period and men experienced significant improvement in leg incision discomfort while women did not. Neither gender group, on their own, demonstrated improvements in SOB or nature of SOB. When the sample was divided for age groups, both groups demonstrated significant decreases in chest incision, neck, swelling discomforts. Older subjects had significant decreases in back pain, while the younger subjects did not. Neither age group had significant improvements in leg incision, SOB, or nature of SOB discomforts/ symptoms.

Few investigations have been undertaken which focus on gender differences related to postoperative discomforts or symptoms. Hawthorne (1994) found that women complained more of incisional discomfort than men; Moore (1995) found that women tended to report more problems with breast

pain and in a manner not similar to men; and King and Gortner (1996) found that sternal wound healing and discomfort (shooting, sharp pain into breasts, chest numbness) were frequent problems for women postoperatively. Although these observations were not revealed in our study, when women were asked about `helpful hints' to others having this operation, some women suggested `wearing a good bra' as helpful. Though breast size has been identified as a risk factor for sternal wound complications following cardiac surgery (Copeland, Senkowski, Ulcickas, Mendelson, & Griepp, 1994), there were too few women with chest incision infections to warrant such statistical analysis.

In summary, it appears that neither gender or age had a consistent impact on improvement in discomforts and symptoms over the postoperative period or on the nature of those discomforts and symptoms.

Use of Health Services. For the total subject group, subjects continued to see their physicians for regularly scheduled checkups over the three month follow-up. Over time, fewer subjects needed to see physicians for new problems, required rehospitalization, or used the services of a registered nurse for homecare. These trends changed very little when the sample was divided into gender groups. However, over the three month follow-up, men's reports of attending a physician for a new problem showed no significant improvement, nor did women's rates of rehospitalization. Although never with a statistically significant difference, women consistently used more homecare services than their male counterparts (this is consistent with findings of Gortner, Jaeger, Harr, & Hlatky (1994) from an elderly cohort). Younger subjects shared a significant decrease over time in seeing a physician for a new problem, and homecare use. Older subjects demonstrated no significant change in seeing a physician for a new problem, but shared decrease in rates of homecare use. Thus there was not consistent difference in either gender or age group with

regard to health services use.

Sources of Support. Though not always statistically significant, over the course of having cardiac surgery, men and younger people consistently reported having more social support (as measured by the Shortened Social Support Scale) than their group counterparts. In addition, it was apparent when asked `who had been helpful' and `who had been the source of emotional support', that men were more likely to have a spouse, and indeed rely on that spouse quite consistently through the postoperative period.

Women, on the other hand, relied on a broader network; including spouses (when applicable), other family members (primarily daughters) or health professionals for this support. Berkman, Vaccarino, and Seeman (1993) found although women were more likely to report having a close emotional relationship with another person, men were more likely to name their spouse as that confidant, while women were more likely to name another woman or friend. Women in our study were less likely to be married, and have a spouse to care for them. Yet, when comparisons were made between those men and women who had spouses, women relied on their spouses for help or emotional support less frequently than men. Women tended to look to their daughters or `others' (most often homecare or rehabilitation nurses).

In summary, the objective measure of social support (Shortened Social Support Scale) indicates that women and older subjects had less social support than their group counterparts. The supplementary data from questions such as `Who has been most helpful?' and `Who has been the most emotional support?' indicates that women actually relied on a more broad base for support than men, and reaped less social support.

Life Quality, Life Satisfaction and Perceived Recovery. Over the three month period following cardiac surgery, subjects' ratings of life quality, life

satisfaction, and perceived recovery gradually improved. Men consistently reported higher life quality scores than women, however there were no differences between age groups' life quality scores. There were no differences between gender or age groups in amount of improvement in life quality over time. There were no significant gender or age differences in scores, or amount of improvement over time for subjects' life satisfaction. Older subjects consistently reported higher perceived recovery scores than younger subjects, however there were no differences between gender groups' recovery scores. There were no differences in amount of improvement between gender or age groups.

When measuring life quality, life satisfaction and perception of recovery separately, though always demonstrating improvement over time, no consistent distinctions between age or gender groups were revealed. In the multivariate analysis though, men consistently reported higher composite scores (of life quality, life satisfaction, and perceived recovery) than females, and older subjects consistently reported higher scores than younger subjects. Older subjects were also found to demonstrate more improvement over time than younger subjects.

Conceptualization and measurement of the concepts measured in this particular component (life quality, life satisfaction, perceived recovery) varies from study to study, and thus poses a problem in comparing findings. In addition, few studies make the comparative analysis between gender and age groups undertaken in our study. Thus, comparison of findings from this study with those cited in the literature is done with some caution.

Authors (Jenkins, et al., 1983; Gilliss, et al, 1993; Langelluddecke, Fulcher, Baird, Hugehse, & Tennant, 1989; Papadantonaki, Stotts, & Paul, 1994; Steingart, 1992) have reported that cardiac surgery recovery is linked to

a gradual improvement in life quality of patients who undergo such a procedure. As stated, this conclusion is consistent with findings from our study. The notions of life quality and life satisfaction have been confounded in some past research (Flynn & Frantz, 1987; Varvaro, 1993), however in a recent study, King, et al. (1994) studied and measured life satisfaction as a separate construct. They (as did we) found no difference between genders in life satisfaction following CABG surgery. Although our findings did not support that genders differ in ratings of perceived recovery, Gortner, Jaeger, Harr, and Hlatky (1994) reported that in the elderly, "women's perceptions of their recovery of health were lower than those of men at 1 month... and again at 1 year" (p. 21).

King (1993) found that older women reported a qualitatively more positive outcome than younger women. Varvaro (1993) reported that older women (aged 65 and over) had higher life satisfaction scores, less perceived problems with adaptation, less emotional concerns and more adaptive behaviours than younger women following a cardiac event. In general, older women demonstrated greater improvement post event that their younger counterparts. Wagnild and Young (1990) have called this characteristic, `resilience'. Hawthorne (1990) found women tended to see their surgical experience as an inconvenience related to aging rather than then major life crisis identified by men. Our study also found that older subjects reported higher levels of recovery, demonstrated a greater improvement over time, and higher composite scores, than their younger counterparts.

Changes from Preoperative to Three Months Postoperative Phases

Life Quality and Life Satisfaction. When scores for life quality and life satisfaction taken from the preoperative through to three month postoperative phases were analyzed, there were significant improvements in the composite

scores over time. Although men consistently reported higher composite scores than women and conversely, younger subjects consistently reported lower scores than the older subjects, there were no significant differences between gender or age groups for amount of improvement over time.

For life quality, men consistently reported higher scores than women, and older subjects consistently reported higher scores than younger subjects. There were no significant differences between gender or age groups in amount of improvement over time. When considering life satisfaction scores, older subjects consistently reported higher scores, and an interaction effect was significant as well (older men consistently reported higher scores than others). There were no significant differences in amount of improvement in life satisfaction scores over time. By including preoperative phase data in this analysis, findings revealed that life quality differed overall in between gender and age groups; men and younger subjects reported higher scores. In addition, age group differences (older subjects reporting higher life satisfaction) were revealed in life satisfaction scores as well as an interaction between age and gender (older men having higher life satisfaction scores).

A critique of much previous research about cardiac surgery recovery is that there are little longitudinal data to support inferences about differences between groups and changes over time (Carroll, 1995; King, et al., 1994; Jaarsma, et al., 1994; Shumaker & Czajkowski, 1993; Wu, 1995). This finding, from analysis of longitudinal data (analysis in which preoperative and follow-up data were included) enhances effects found between groups and over time, and exemplifies the need for inclusion of baseline data in analyses.

Expected and Realized Benefits. `Were the patient's goals for surgery realized?' has been a question asked in a number of studies from the Cardiac Recovery Laboratory at the University of California, San Francisco (Gortner,

Gilliss, Moran, Sparacino, & Kenneth, 1985; Gortner, Gilliss, Paul, Leavitt, Rankin, Sparacino, & Shinn, 1989; Gortner, Jaeger, Harr, & Miller, 1994). Findings from Gortner, et al. (1985) and Gortner, et al. (1989) revealed although the majority of patients' expectations for surgery were met six months postoperatively, women and younger subjects were less likely to achieve their preoperative goals. However, when studying elders (those 70 years and older) Gortner, Jaeger, Harr, & Miller (1994) found that "gender did not have any statistically significant influence on the ratio of realized to expected benefits; neither did age" (p. 12).

It was apparent that the majority of subjects in this study also realized their preoperative goals of prolonging life, resuming activities, improving life quality, and travel. In addition, subjects generally realized the benefit of having less pain and fatigue, and any stated goals (from the preoperative interview). Preoperatively, significantly more women than men hoped that having cardiac surgery would enable them to resume activities in which they currently could not engage. Three months postoperatively, though not a statistically significant difference, only 63% of women and 78% of men realized that goal. There were also significant differences between genders in realizing the goal of prolonging life; fewer women than men believed that the surgery had prolonged their life. There were, however no age group differences in realizing preoperative goals for recovery.

When considering subjects' preoperative expectations for recovery and perceptions of recovery at three months postoperatively, there were no significant differences between gender or age groups at either time. There was a statistically significant difference noted however, in perception of postoperative recovery and what was expected preoperatively; indicating that subjects did not perceive their postoperative recovery met their preoperative

expectations. This finding was not affected by gender or age group. Thus neither gender or age affected degree to which goal for recovery was met.

At three months postoperatively, subjects were asked `If you were to consider having surgery again, would you choose it?'. Ninety percent of responding subjects indicated they would indeed choose surgery again. Gortner, et al. (1985) asked 66 subjects six months following bypass surgery whether they would consider having surgery again and found similar results; 92% said they would do it again. Interestingly, some of their subjects indicated that time was a factor in their response; had they been asked this question as early as eight weeks following surgery, their answer would have been no. Thus, it is possible that with time, and further recovery, even more subjects from this study would agree that they would consider having surgery again, if need be. Analysis of gender and age group differences for this sample revealed that significantly fewer women said they would choose surgery again; perhaps reflecting women's lesser realization of preoperative goals. Rankin (1990) found that only 57% of women would undergo a second surgery while 88% of men would be willing to do so. Rankin suggested that women calculate benefits differently than men. There were no statistically significant age group differences for whether subjects would undergo surgery again.

Subjects were also asked the question, `Are you satisfied with your decision to have surgery?'. Ninety-eight percent of responding subjects indicated they were indeed satisfied with their decision. There were no gender or age group differences regarding overall satisfaction with subjects' decision to have cardiac surgery. Many subjects indicated they felt there was really no choice; their symptoms had been so great preoperatively, and their function so limited, that surgery was their only alternative.

Functional Status. Preoperatively, men had significantly higher

functional status scores than their female counterparts; indicating that men could engage in more physical activities than women, without consequence of cardiac symptoms.

Over a three month cardiac surgical recovery period, King and Gortner (1996) found in a small cohort of women, that functional status (as measured by the DASI) did not improve significantly. Jaeger, et al. (1994) reported though both elderly men and women demonstrated improvement in functional status (as measured by the DASI) from preoperative through to one year postoperative measures, and men had consistently higher functional status scores than their female counterparts. Though using other measures of functional status, King, et al. (1994) observed that in their study and research by Artinian and Duggan (1995), the magnitude of change over time in functional status was similar between men and women. They too found that men had consistently higher functional status scores, and argued that the `lower' postoperative functional scores for women which were evident preoperatively, were due to preexisting differences, and should not be considered poorer response by women to the surgical intervention.

Our study findings do not follow these trends. Over the three month recovery period, there was significant improvement in the overall functional status scores of study subjects. Women's scores, however, were likely to improve significantly more than men's scores, and at three months postoperatively there were no significant differences in men's and women's functional status scores. Interestingly there were no age group differences found at the preoperative or postoperative time.

Preoperatively, age was not associated with functional status for the total subject group or any gender or age subgroups. However, at three months postoperatively, functional status in the total subject group was negatively

correlated with age, and when the sample was divided into gender and age subgroups, functional status and age were negatively correlated only for women and those over 65 years. Thus, at three months postoperatively only, women's and older subjects' functional status scores decreased with age. Jaeger, et al. (1994) found the "...degree of (functional status)improvement attained diminished with advancing age" (p. 108) at one year postoperatively, and the increment in functional improvement was actually smaller in elderly women than elderly men. Our findings from the entire cohort of subjects when correlating degree of change in functional status and age do not support this trend (NS correlations for DASI difference and age). However, when the cohort was divided into subgroups, a significant negative correlation was found between improvement in functional status (as early as three months postoperatively) and age in the over 65 years subgroup ($r=-.262$, $p=.043$); supporting findings from Jaeger, et al. measured at one year postoperatively.

Our findings also indicate that significance (and magnitude) of correlations varied depending on whether the entire sample, or various subgroups were being examined. The following illustrates the variability in findings of significant correlates of functional status for both the preoperative and postoperative measures. This is particularly important to consider, as only when examination of subgroups takes place, that subtle differences from the entire cohort can be identified; making functional status more or less appropriate for use in these subgroups.

Preoperative Functional Status						Postoperative Functional Status					
Variable	Significant Correlation					Variable	Significant Correlation				
	all	♂	♀	<65	≥65		all	♂	♀	<65	≥65
age						age	x		x		x
life quality	x		x	x	x	life quality	x	x	x	x	
life sat.	x			x		life sat.	x	x	x	x	x
hlth state	x		x	x		hlth state	x	x	x	x	x
NYHA	x			x		NYHA	x	x			x
						recovery	x	x	x	x	x

Health State. Not surprisingly, subjects' ratings of health-related quality of life (health state) improved over time. However, there were no differences identified between gender or age groups in magnitude of change in health state experienced over time. As when examining functional status, correlates of health state were examined; for the entire sample and the various subgroups. Again, the significance (and magnitude) of correlations varied. The following illustrates the variability in findings of significant correlates of health state at both the preoperative and postoperative measures. Again, this is particularly important to consider, as only when examination of subgroups takes place, that subtle differences from the entire cohort can be identified; making this measure more or less appropriate for use in these subgroups. As found in this kind of analysis with functional status, there are more frequent and more consistent correlates in the subgroups when health state was measured postoperatively than at preoperatively

Preoperative Health State						Postoperative Health State					
Variable	Significant Correlation					Variable	Significant Correlation				
	all	♂	♀	<65	≥65		all	♂	♀	<65	≥65
life quality	x	x		x		life quality	x	x	x	x	x
func status	x			x		func status	x	x	x	x	x
NYHA	x	x	x	x	x	NYHA		x	x	x	x
						recovery	x	x	x	x	x
						soc support	x	x	x	x	
						life sat	x	x	x	x	x

Predictors of Cardiac Surgery Recovery

The descriptive, univariate, and multivariate analyses revealed that neither gender or age consistently affected components (as indicated by the study's conceptual framework) of cardiac surgery recovery. However, multiple regression analyses were run to examine what factors might influence or predict recovery and how recovery might be best operationalized. Independent and dependent variables for multiple regression equations were chosen primarily on the basis of the study's conceptual framework and statistical analyses. The independent variables (or factors) considered in the multiple regression equations were the preoperative variables--age, female gender, BMI, NYHA status, and social support; the intra-hospital phase variable--length of stay; the postdischarge phase variable--rehabilitation attendance; and the recovery variables--NYHA classification, perception of life quality, functional status, and health state. Self-perception of recovery, functional status, and health-related quality of life (health state) were chosen as indicators of recovery (dependent variables) for three separate regression equations. These variables were both objective and subjective indicators of biopsychosocial

constructs.

The subjective indicator, perceived recovery was better predicted by the independent variables than were the more objective indicators, functional status or health state. Nearly 67% of the unadjusted variance in perceived recovery was explained by the variables age, female gender, BMI, preoperative NYHA status, social support, length of stay, rehabilitation attendance, postoperative NYHA classification, perception of life quality, and functional status. While only 31% of the unadjusted variance for functional status and 30% of the unadjusted variance of health state were explained. Neither gender or age were consistent significant predictors of these outcome variables; only current perceived life quality was a common predictor for all three dependent variables. Female gender, preoperative social support, current NYHA status, and life quality (though postoperative functional status approached significance with $p=.058$) made a significant contribution to perceived recovery. Thus women, with higher social support scores, and postoperative scores reflecting lower NYHA status (or fewer cardiac symptoms) and higher perceptions of life quality tended to have higher perceptions of recovery. Age, life quality, and health status were predictors of functional status; younger people (not surprisingly) with higher current perceptions of life quality and health state scores tended to have higher functional status scores. Current life quality and functional status were the only predictors of health state; those with perceptions of higher life quality and higher functional status scores tended to have higher health state scores.

There were no preoperative, intra-hospital, or postdischarge phase variables which could consistently predict cardiac surgery recovery at three months postoperatively. Neither gender or age were consistent predictors of cardiac surgery recovery. In addition, the more traditionally considered factors,

such as cardiac risk factors and symptoms, length of hospital stay, and rehabilitation attendance were not predictive of any of the recovery variables. The objective recovery phase variables were not consistent predictors of recovery; of particular interest is that cardiac symptoms (NYHA status) was predictive only of perceived recovery and not the objective measures of functional status and health state. Only the subjective recovery phase variable, life quality, significantly predicted all three recovery indicators.

It is important to make efforts to predict those patients who are at most risk for surgical recovery difficulty so resources can be implemented early to assist these people to make maximum recovery possible (Rankin, 1990; Treasure, Holmes, Loughead, & Gallivan, 1995). Anticipatory guidance and preparation can be offered and plans put in place for appropriate resources to be made available to the patient and their families. Our study demonstrates just how difficult the process of predicting outcome can be; there were no consistent preoperative predictors of any of the three recovery indicators. In particular, neither female gender or age were consistent significant predictors of any of our study's recovery indicators. The research hypothesis, `age has a greater effect than gender on cardiac surgery recovery', was not supported.

Similarly to Rankin (1990), our review of the literature indicated that women were more at risk for having poorer biophysical and psychosocial outcomes following cardiac surgery. Importantly, our study demonstrated that female gender did not predict poorer recovery in any regression equations. In fact, when female gender was a statistically significant predictor of outcome, female gender predicted *better* self-perceptions of recovery at three months postoperatively.

Summary

There has been some concern that women may not be investigated as

aggressively as men when presenting with heart disease symptoms, in part because women are not believed to `do as well' if referred for surgical intervention (Ayanian & Epstein, 1991; Steingart, et al., 1991). When controlling for gender and age through sample stratification, and considering a broad biopsychosocial view of recovery (which attended to potential gender differences in appraisal of social support, and recovery), our findings indicate that the `accepted' belief that women do not `do as well' when having cardiac surgery may not be well founded. Findings from our study indicate that although women were more functionally impaired and had less social support than men preoperatively, they improved consistently and significantly over the postoperative follow-up; there were gender-specific recovery trajectory differences which were more often related to social support and other psychosocial factors, rather than to biophysical differences; and neither gender or age consistently predicted cardiac surgical outcome.

Elements of Significance

Although cardiac rehabilitation referral and attendance, social support, return to `work', and recovery from cardiac surgery have been discussed in light of study findings, these elements warrant special attention to their significance in relation to women.

Cardiac Rehabilitation Referral and Attendance

Cardiac rehabilitation attendance was limited to approximately one third of our study's sample, which actually exceeds common estimates of rehabilitation attendance of 15-30% (Cardiac Rehabilitation Guideline Panel, 1995; Garriker, et al., 1992). Despite this attainment, cardiac rehabilitation referral, access, and attendance patterns remain important health promotive issues for people following cardiac surgery. Cardiac rehabilitation programs have the potential to impact patients from a broad biopsychosocial perspective,

shown in this study to warrant consideration. Further discussion will demonstrate particular reference to women and the aged.

Accumulated evidence to date clearly indicates that cardiac rehabilitation is an essential component of the management of patients with cardiac disease (Cardiac Rehabilitation Guideline Panel, 1995; Greenland & Chu, 1988; Heart and Stroke Foundation of Canada, 1996). Cardiac rehabilitation is a multifaceted program (including exercise training, education and counselling regarding risk reduction, lifestyle changes, and coping with the disease process) aimed at risk factor interventions in order to improve the physiological and psychosocial status of cardiac patients (Balady, et al., 1994). Comprehensive risk factor interventions have been demonstrated to extend overall survival, improve quality of life, decrease the need for interventional procedures, and reduce the incidence of subsequent MI in patients with CAD (Smith, et al., 1995). Though often considered as helpful for patients following MI, cardiac rehabilitation can be beneficial to patients following CABG and valve surgery (Greenland & Chu, 1988; Balady, et al., 1994; Garriker, et al., 1992). Much cardiac research has focused on middle aged men, however there is evidence to suggest that women and the elderly also benefit from such programs (Ades, et al.,1995; Ades, Waldmann, et al, 1992; Cannistra, et al., 1992; Cardiac Rehabilitation Guideline Panel, 1995; Greenland & Chu, 1988; Lavie & Milani, 1995a,b; Low, 1993).

Participation in cardiac rehabilitation programs have been associated with both biophysical and psychosocial improvements. Biophysical improvements include better exercise capacity and habits; optimization of risk-factor status, including improvement in blood lipid and lipoprotein levels, body weight, blood glucose and blood pressure levels; and cessation of smoking (Balady, et al., 1994; Smith, et al., 1995). Enhancement of myocardial

perfusion and performance as well as reduction in progression of the underlying atherosclerotic processes are additional potential benefits (Cannistra, et al., 1992). Improvements in psychosocial functioning should include reduction of stress, anxiety, and depression. Functional independence of patients is also an essential goal which includes return to appropriate and satisfactory vocational and activity status (Cardiac Rehabilitation Guideline Panel, 1995; Balady et al., 1994; Smith, et al., 1995).

Patients who are at low to moderate risk for proximate coronary events are those who have been most typically referred for cardiac rehabilitation. A significant proportion of patients following CABG and valve surgery are at low risk for proximate coronary events, representing the segment of cardiac patients who are least likely to have unfavourable sequelae from exercise training and who have been shown to demonstrate significant improvements in risk factor modification (Cardiac Rehabilitation Guideline Panel, 1995; DeBusk, et al., 1994). However, patients who have more complicated recovery and heart disease following cardiac surgery, and who are elderly, are more commonly benefitting from more gradual, supervised exercise training or from other components offered through multifaceted cardiac rehabilitation programs (Cardiac Rehabilitation Guideline Panel, 1995; Greenland & Chu, 1988; Balady, et al., 1994; Garriker, et al., 1992; Williams, Maresh, Esterbrooks, Harbrecht, & Sketch, 1985).

Variables which contribute to cardiac patients accessing and utilizing cardiac rehabilitation services include an appropriate referral by the health care practitioner, proximity to the service, inherent characteristics of the patient (including self-efficacy and self-motivation), and social support (Cannistra, et al., 1992; Lavie & Milani, 1995a; Moore & Kramer, 1996; Oldridge & Stoedefalke, 1984; Rhodes, Morrissey, & Ward, 1992; Yates, Skaggs, &

Parker, 1994). A number of agencies have developed uniform guidelines to direct the appropriate referral of patients for this valuable component of cardiac health care; including the U.S. Department of Health and Human Services (Cardiac Rehabilitation Guideline Panel, 1995), American Heart Association (Balady, et al., 1994), and American Association of Cardiovascular and Pulmonary Rehabilitation (1995). However, whether referrals of patients to cardiac rehabilitation are made appropriately and consistently is not well known (Lavie & Milani, 1995a; Wenger, et al., 1993). In Alberta, with our high rural population, referral and attendance may in fact be lower, as easy access to formal cardiac rehabilitation programs is often limited to urban areas. In addition, women and the elderly have more difficulty travelling to and consistently attending programs (Lavie & Milani, 1995a,b). Perceptions of having social support networks is correlated with severity of CAD, having healthy cardiac outcomes, and sustaining healthy behaviour (Cohn, 1988; Ruberman, et al., 1984; Yates, et al., 1994).

Generally, women and the elderly are known to be referred less frequently, have more difficulty with access to facilities, and are less likely to finish rehabilitation programs than their male counterparts (Cannistra, et al., 1992; DeBusk, 1992; Garriker, et al., 1992). Explanations for this problem are diverse and have been touched on in earlier discussion. However, the issue of relevance of cardiac rehabilitation program material to women, requires some comment. The content of cardiac rehabilitation programs is geared to the male majority among participants. To keep women motivated to attend rehabilitation programs, the program material needs to be helpful and relevant to them; including counselling related to feelings regarding role performance and the impact of the process on relationships, and developing specific activity guidelines (Low, 1993; Moore & Kramer, 1996; Murdaugh, 1990; Parchert &

Creason, 1989).

Social Support

The positive impact of social support on health has been known for some time. Berkman and Syme (1979) as well as House, Robbins, and Metsner (1982) found that people with fewer social connections had a higher age-adjusted mortality rate from several diseases, including heart disease. Researchers have found following MI and revascularization procedures (such as PTCA and CABG surgery), those who are more socially isolated and have low social support may be at greater risk for further cardiac events, have more symptoms of psychologic stress, longer recovery periods, and up to twice the rate of mortality than those who have social networks that provide social support (Berkman, Leo-Summers, & Horowitz, 1992; Kulik & Mahler, 1989; Moser, 1994; Ruberman, Weinblatt, Goldbert, & Chaudhary, 1984; White & Frasure-Smith, 1995). Moser (1994) advocates that social support indeed plays a powerful role in recovery from a cardiac event.

However, Berkman, et al. (1992) and Moser (1994) caution that social support can be perceived as helpful or problematic. Support perceived as overprotectiveness can be a problem, leading to decreased self-esteem, increased disability and emotional distress. In a study of concerns of postoperative and MI patients, problems related to social support included loss of social contacts, being over protected by others, and feeling watched (Jaarsma, et al., 1995). Thus measurement of social support, as done in our study using the Shortened Social Support Scale, must consider not only the nature of the network, but the perceived benefit of the support.

Women in our study had less social support (as measured by the Shortened Social Support Scale) than their male counterparts. Although women's support network appeared to be much more broad that men's,

including spouses (though women were less likely than men to be married), children (most often daughters), friends, and others (often home care staff), the perceived benefit of that network was lower. Despite the depth of apparent resources for social support, it was evident that the quality of the relationship was of import. Men and older subjects in our study reported feeling `taken care of' and that their caregiver was `supportive' much more frequently than women. Women reported appreciation of help with `their work' more frequently--reflecting the perception that work in the home belonged to them, and less connection to the network supporting them.

However, when looking at patterns of subjects' responses to the questions regarding those looked to for `help' and `emotional support', women tended to look to their spouses more for emotional support. They looked to their husbands for emotional support more frequently than they did for concrete help. Young and Kahana (1989) contend that men are actually better able to provide tangible support, such as task management, than in meeting emotional needs. Women were looking to husbands for support that they may not have been well prepared or able to give.

Since social support plays such a significant role in recovery from cardiac surgery, implementing strategies to enhance women's perception of having social support would seem prudent. If women were counselled preoperatively regarding the potential choices they make when looking to their network for `help' and `emotional support', perhaps women would have more realistic expectations of the members in their network and glean perceptions of more adequate social support. If women were counselled to make different choices in who they looked to for help and support postoperatively by looking to their husbands for the more tangible support they are apparently capable of offering and rely on their broad base of other sources for emotional needs,

their expectations might be more realistic and their perceptions of support may be improved. Unfortunately as women age, they are less likely to have the breadth of social network to make these choices, and remain disadvantaged.

Women often looked to other health care providers for support, support which could be appropriately offered through cardiac rehabilitation programs. Creativity may be an important feature of developing strategies to overcome some of the difficulties that women in particular face, when trying to attend these programs. Telephone follow-up and women's support groups have been only a few means by which this kind of support may be successful. Teleconferencing may prove to be another means by which services and supports may be accessible to rural populations.

Return to `Work'

When exploring gender differences in cardiac surgery recovery, one particularly salient aspect continues to arise; return to `work' is not equivocal to return to `employment'. For women, much of their `work' is located in their place of recovery, their home. On the other hand, men's `work' is located at their place of employment usually outside the home. Data on return to work and productivity indicate that men are more likely to return to employment. This may be because men are generally younger when having cardiac surgery and are more likely the primary provider (income earner) in the family. Women may be perceived as having less pressure to return to employment. However, the nature of women's `work' is not well documented or operationalized to allow for appropriate comparisons (Shumaker & Czajkowski, 1993).

Women in our study repeatedly expressed appreciation to their caregivers for help with `their work'. Over the course of their three month follow-up, women more quickly returned to activities including homemaking

and caregiving, before they returned to any outside employment. King and Jensen (1994) found that engaging in domestic `work' was an important strategy used by women to `preserve the self' while having cardiac surgery. "Women...engaged in domestic role related behaviours early in their recovery at home as a means of `testing' their wellness, reassuring family members that they were recovering (protecting family from worry), and protecting themselves from feeling vulnerable to others' judgements about their lack of role performance" (King, 1993, p. 103). As in other studies (Boogaard, 1984; Johnson, 1988; King & Gortner, 1996; King & Jensen, 1994; Varvaro, 1991) our study findings indicate that women, despite their employment circumstance, often described their recovery in terms of homemaking behaviours like making beds, washing dishes, and ironing.

These domestic role functions are of high psychological value to women, but are poor choices of cardiovascular activity (Low, 1993; Murdaugh, 1986; Parchert & Creason, 1989). Moore (1995) found though 70% of women were reporting sweeping and vacuuming as early as three weeks postdischarge, only 60% were out walking and doing work that would benefit their cardiac health. Women do not take into account that household activities are energy consuming and their energy would be better spent in activities which would improve their cardiovascular function, to which housework (which is primarily anaerobic in nature) will not contribute. Yet women, particularly those without the support and knowledge which could be gleaned from access to and attending rehabilitation programs, continue to make poor choices regarding activity. Dumas (1992) argues that health care providers need, as the first step to helping women improve their own health, to teach "women the importance of caring for themselves as well as they have traditionally cared for others" (p. xii). Appropriate and timely cardiac teaching, beginning before women have

their surgery, is that `first step'.

What Constitutes Women's Recovery from Cardiac Surgery?

Researchers are not necessarily in agreement about what factors ought to be considered and measured when studying recovery from cardiac surgery, in general. In addition, operationalization of the concept of recovery for either gender or age-specific groups, has not been well established. A number of researchers interested in cardiac surgery recovery have undertaken investigations which have contributed to developing what we now understand about this broad concept. Physical recovery has been operationalized using a variety of measures including self-perceptions, surgical and cardiac symptom inventories, NYHA status, activity/functional status measures, return to employment, return to sexual activity, evaluation of sickness impact. Psychological recovery has been operationalized using self-perceptions, scales to measure anxiety, depression, coping, psychosocial adjustment, perceptions of social support, self-efficacy, and mood (Artinian, et al., 1993; Gilliss & Rankin, 1988; Gilliss, et al., 1993; Gortner, et al., 1985; Gortner, et al., 1988; Gortner et al., 1989; Gortner & Jenkins, 1990; Gortner, Jaeger, Harr, & Hlatky, 1994; Gortner, Jaeger, Harr, & Miller, 1994; Jaeger, et al., 1994; King, 1985; King, Clark, & Hicks, 1992; King, Clark, Norsen, & Hicks, 1992; King & Gortner, 1996; King & Jensen, 1994; King & Parrinello, 1988; King, Porter, Norsen & Reis, 1992; King, Porter, & Rowe, 1994; Low, 1993; Moore, 1996; Rankin, 1989, 1990). Though it is becoming increasingly apparent that consensus is growing regarding the breadth of the concept of recovery, there is not as great an agreement on how recovery from cardiac surgery is best operationalized, in general or for when studying specific gender or age groups. Examining patients' perspectives of recovery, and factors which contribute to or predict recovery, should provide some direction in refining the definition,

and improving operationalization of this concept.

In a manner consistent with the study's conceptual framework, and accumulated evidence regarding gender differences in cardiac surgery recovery, recovery was operationalized using objective and subjective measures of biophysical and psychosocial factors. Findings from this study confirm what others are beginning to suggest; recovery is a biopsychosocial process which may indeed have different meanings, and need to be operationalized in a manner, which is at least in part, dependent on gender.

Earlier findings from King & Jensen (1994) suggested that women gaged their success in recovery, not based on their physical health, but despite their physical health. Whether women believed they could `move on' from the experience of having cardiac surgery was not contingent on their physical improvement, but on their ability to integrate the changes which had taken place into their lives. Findings from a small cohort of women studied by King and Gortner (1996) revealed that perceptions of recovery improved before the more objective measures of functional status or health state improved. Though women in our study demonstrated significant improvement in objective indicators of health, these were not significant predictors of their recovery, nor were these measures best predicted. In fact, self-perception of life quality was the most consistent predictor, and self-perception of recovery was the best predicted (nearly 67% of variance predicted).

Brown and Gillespie (1992) argue that a more relational model which reinforces social and emotional connections between people, should be considered when exploring recovery, rather than one of independence as the standard or goal. Social support is well documented to contribute to health and to recovery from cardiac surgery (Berkman & Syme, 1979; Berkman, et al., 1992; House, et al., 1982; Kulik & Mahler, 1989; Moser, 1994;

Ruberman, et al., 1984; White & Frasure-Smith, 1995). In addition, social support was a significant predictor of women's perceptions of recovery from cardiac surgery in this study. Relationships are significant parts of women's perspectives and ability to manage difficult events (Blumenthal & Matthews, 1993; Parchert & Creason, 1989; Hawthorne, 1994; King & Jensen, 1994). Thus, considering women's social context, may be particularly important when examining their recovery from cardiac surgery.

Recovery following cardiac surgery is a dynamic process (King, 1993; Germino & Pole, 1990; Gortner & Jenkins, 1990) which may indeed begin with preoperative expectations (Gortner, et al., 1989) and have no particular time-limited end. Germino & Pole (1990) call recovery "the process of getting back to normal, regaining what has been altered or lost, or making up for the loss" (p. 313). Findings (though not always statistically significant) from this study indicate that women's recovery target is one which may be some composite of factors such as age, preoperative expectations, time, self-perceptions (which might include ability to adjust and incorporate change), and social support. Notably absent in this description are factors related to change in physical condition or ability.

Although it would be counter-intuitive to rule out inclusion of biophysical factors (physical health) in conceptually or operationally defining recovery, findings from our study clearly do not support their primacy. It is apparent that women's recovery from cardiac surgery is not merely about physical improvement; it is about redefinition or preservation of women's sense of self in connection with others. Incorporation of subjective, psychosocial measures into studies examining women's recovery from cardiac surgery, should not simply be encouraged, but be required as legitimate and substantive components of the investigation.

Study Limitations

There are a number of limitations to this study which relate to internal and external validity; reliability and validity of measurement, and generalizability of the findings.

Limitations Affecting Internal Validity

Although every effort was made to assure that data were collected in a consistent manner, the nature of the follow-up procedures could have posed limitations. The success of patient follow-up was largely due to the relationship built with subjects by the researcher and assistants over the telephone. The rapport developed with study subjects could vary from person to person, thus affecting the subjects' serious consideration of the questions, and the candor with which they responded. Since most preoperative and follow-up measures were self-reports, we relied heavily on the subjects' ability to accurately respond to questions regarding their own health, and their willingness to share their experience with someone over the telephone.

Inter-rater reliability was established early in the study's onset. However, over time as comfort grew with the interview guides and measures, inter-rater reliability was not rechecked. Intra-rater reliability could also be questioned as time and increasing comfort with the interview guides and measures would affect consistency.

The difficulties described early when using the McMaster Health State System also caused some concern regarding the validity of the health-related quality of life score, particularly due to the `pain' component of the measure. The pain scores were carefully recalculated based on other interview and medical record data, and if in any doubt, consensus was achieved when consulting with another nurse clinically competent in cardiovascular nursing. Findings related to use of that measure were consistent with other measures

which were expected to perform similarly, and to findings from other studies (King & Gortner, 1996).

Some difficulties arose due to missing data; whether from medical records or missing interviews. The completeness of medical records varied from institution to institution, making compilation of some data impossible. For example, it was not possible to make inferences regarding extent of vessel disease or ventricular function (important components of surgical risk) because these data were simply missing in so many cases. In addition, not all subjects were available for their follow-up interviews at one and two months postoperatively. When doing repeated measures and multivariate analyses, these missing data were substituted with the average value for the appropriate gender and age category. The effect of this practice likely limited the variability of scores, and perhaps the significance of some of the findings.

Limitations Affecting External Validity

A number of factors affected generalizability of the study findings. First, this was a convenience (gender and age stratified), rather than randomly selected (Wood & Brink, 1989) sample; second, subjects were required to submit to four interviews. It is possible that this burden created some self-selection bias; third, subjects were sampled from the cardiac surgical population in Alberta. Though provincial centres for cardiac surgery varied in practice, our provinces population base is likely not representative of that of our country; and fourth, only those subjects who underwent planned surgical intervention, and who were well enough to be interviewed preoperatively were asked to participate in this study. Thus, these findings cannot be extrapolated to those who were critically ill preoperatively or for whom surgery was emergent, and likely are not representative of the cardiac surgical population at large.

Recommendations for Further Research

Particularly over this decade, health researchers have learned that there are specific gender and age related factors which contribute to all phases of having cardiac surgery; from diagnosis through recovery. These factors are now being explored and described fairly regularly. After laying this foundation of knowledge, it is incumbent upon health care providers to begin to consider and test interventions which will enable them, and the patients with whom they come in contact, to use what is currently known to maximize outcome benefits.

Although the focus of this study was restricted to those who had been diagnosed with heart disease and indeed had cardiac surgery, it would be remiss of any cardiovascular health researcher not to be concerned with issues related primary prevention of heart disease. Thus, in recommending areas for further research, interventions which focus on women developing healthy lifestyles for themselves and their families is of primary importance to consider.

Anecdotally, King and Gortner (1996) as well as King and Jensen (1994) found women had difficulty in communicating their symptoms and concerns to physicians. Interestingly, Birdwell, Herbers, and Kroenke (1993) found that presentation style profoundly affected how internists examined and treated a simulated patient situation (40 year old woman presenting with chest pain). It is argued that women's social roles affect their efforts to make themselves heard in the health care environment (Gauthier and Krassen-Maxwell, 1991). The skill which women possess to communicate with their health care provider, has the potential to affect whether or not their symptoms of cardiac disease, which can be quite diverse (Arnstein, et al., 1996), are indeed recognized. Conversely, the concern and time (Gauthier & Krassen-

Maxwell, 1991) which health care providers dedicate to managing issues related to communication, will affect the attention women receive. Strategies to enhance the nature of the patient-provider relationship (i.e. patient participation and responsibility in the communication process, health care provider knowledge and attention to communication issues) need to be developed and tested. Thereafter, strategies need to be developed and test which are aimed at women, and focus on early recognition of heart disease symptoms, enhancing social support and women's understanding regarding expectations postoperatively, as well as cardiac rehabilitation attendance. Studies focusing on interventions with health care practitioners should include strategies aimed at developing knowledge and appropriate patterns of practice related.

Feasibility studies also need to be undertaken. Foci of these studies should include outreach services to those who have difficulty with access, modes of service provision, and support network development, particularly for those who live in rural areas of our province, or who have difficulties with access to services.

Conclusion

Traditionally, when referring people for cardiac surgery, operative risk has been considered using objectively measurable factors such as age, gender, ventricular function, extent of vessel/valve disease, cardiac risk factors (elevated cholesterol, family history of CAD, diabetes), and comorbidities (arthritis, cancer, respiratory disease, renal disease); and measurement of outcomes (or recovery) has been based primarily on morbidity and mortality data, and cost (Bolooki, et al., 1975; Craddock, et al., 1994; Curtis, et al., 1994; Ennabli & Pelletier, 1986; Heart and Stroke Foundation of Canada, 1996; Jeffery, et al., 1986; Loop, et al., 1983). Using this traditional model, outcomes have been

measured and interpreted based on objective numbers. Women have been seen as older when presenting for surgery, having more comorbidities, and having increased risk of morbidity and mortality when having cardiac surgery. In addition to this typical finding of research from this perspective, what is found about women (and older people, for that matter) is then compared to the 'gold standard' of what has been learned about men and younger subjects (Carey, et al., 1995; Cosgrove, 1993; Ennabli & Pelletier, 1986; Jeffery, et al., 1986; Peigh, et al., 1994). As Steingart, et al. (1991) and Ayanian & Epstein (1991) contend, one could postulate that the nature of this objective reporting has led health care practitioners to limit referrals of women and older subjects for cardiac surgery, because they do not have as objectively successful outcomes.

However, as particular health care disciplines developed their own research traditions, and an interest in the process of cardiac surgery, research evolved from a solely objective and primarily biophysical perspective, to a perspective which also incorporates subjective and psychosocial variables; including social support, self-efficacy, self-perceptions, family influence, coping, and quality of life. And this research was not limited to disciplines outside of medicine (Blacher, 1987; Gundle, et al.,1980; Kimball, 1969a,b). Expanding the purview of research to a biopsychosocial perspective has enhanced the understanding of having cardiac surgery and its outcomes for both men and women. Consequently, a conviction has developed that collecting data which are solely objective and biophysical is simply insufficient when examining such a complex phenomenon as cardiac surgery. Our study exemplifies such a conviction.

Throughout the process of cardiac surgery, there were relatively few differences identified between the gender and age groups and neither gender nor age were helpful in consistently explaining variance in the regression

equations. Although our study adds to the mounting evidence that there are `more similarities than differences' in men's and women's recovery from cardiac surgery (Artinian & Duggan, 1995; Gortner, Jaeger, Harr, & Miller, 1994; Jeffery, et al., 1986; King, Clark, & Hicks, 1992; King, Clark, Norsen, & Hicks, 1992; King, et al., 1994; Rankin, 1990), this should not imply that what differences do exist are unimportant or without consequence. These differences need to be thoroughly described and examined to determine the extent of their impact on cardiac surgery recovery. Thereafter, the challenge and opportunity will lie in exploring and testing suitable interventions.

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APPENDIX A

Informed Consent Form
University of Alberta Hospital

Project Title: Gender Issues in Short-Term Recovery from Cardiac Surgery

Investigator: Kathryn King, RN, MN
PhD Candidate, Faculty of Nursing
University of Alberta
Phone: 492-6836
467-7509 (may call collect)

Supervisor: Janet C. Ross Kerr, RN, PhD
Professor, Faculty of Nursing
University of Alberta
Phone: 492-6253

The purpose of this study is to learn about recovery from heart surgery. A researcher will want to talk with you before your heart surgery and again at one, two, and three months following your surgery. The researcher will also want to review your hospital record to learn about your medical history and some aspects of your hospital stay.

Each interview will last about 15-20 minutes. The first interview will be completed before you have your surgery and will focus on how you feel before surgery. The other interviews will be done over the telephone after you go home and will focus on your recovery. You may be telephoned at a later time to see if you are willing to have some information mailed to your home. You will be asked to read and make comments about the information sent to you. You are free to refuse to do so.

There are some possible risks or discomforts from being in this study. You may find the interview tiring. The interview might bring to the surface some things you might not care to think about. You may stop the interview at any time.

Information from this study may be used for other studies, but only after ethics approval is obtained. Some of your comments may be used in the final report or in talks about the study, but no one will be able to identify you by these comments. Your name and any information that may identify you will be kept confidential. You will have a code number that is known only to

the researcher or assistant. The information you give will be stored in a locked cupboard and will be kept for a minimum of seven years. The consent form which you sign to participate in this study will be kept for a minimum of five years.

Participation in this study is strictly voluntary. Your care while in hospital or after discharge will not be affected in any way by refusing to participate in this study. You can refuse to answer any question in the interview. You can stop the interview or decide not to give another interview, by telling the researcher or calling either of the numbers above. If you have any questions about the study, you may call either of the numbers above.

There may be no direct benefits to you from being in this study. The information that you give may be of benefit to others having heart surgery. If you would like the results of this study, write your name and address in the space provided.

If you would be willing to participate in a long-term follow up of people following cardiac surgery, please answer below.

I _____, agree to participate in the study
(print name here)
`Gender Issues in Short-Term Recovery from Cardiac Surgery'. I have been given the chance to read about the study and ask questions. My questions have been answered in a manner that I understand. I am aware that I will receive a copy of this consent form.

DATE _____

SIGNATURE _____
(participant)

SIGNATURE _____
(researcher)

Please send me a copy of the results of the study

Name _____
Address _____
_____
_____

I would be willing to be contacted at a later time following my surgery to answer some questions about my recovery.

YES ___/ NO___ (check one)

Informed Consent Form
Foothills Hospital

Research Project Title: Gender Issues in Short-Term Recovery from Cardiac Surgery

Investigator: Kathryn King, RN, MN
PhD Candidate, Faculty of Nursing
University of Alberta
Phone: (403) 492-6836
(403) 467-7509 (may call collect)

Supervisor: Janet C. Ross Kerr, RN, PhD
Professor, Faculty of Nursing
University of Alberta
Phone: (403) 492-6253

This consent form, a copy of which has been given to you, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The purpose of this study is to learn about recovery from heart surgery. A researcher will want to talk with you before your heart surgery and again at one, two, and three months following your surgery. The first interview will be completed before you have your surgery and will focus on how you feel before the operation and about your plans following surgery. The other three interviews will be done over the telephone after you go home and will focus on your recovery. Each interview will last about 15-20 minutes.

You may be telephoned at a later time to see if you are willing to have some information mailed to your home. You will be asked to read and make comments about the information sent to you. You are free to refuse to do so.

In addition, the researcher will review your medical record once you have left the hospital, to learn about your medical history and some aspects of your hospital stay.

There are some possible risks or discomforts from being in this study. You may find the interview tiring. The interview might bring to the surface some things you might not care to think about. You may stop the interview at any time.

Some of your comments may be used in the final report or in talks about the study, but no one will be able to identify you by these comments. Your name and any information that may identify you will be kept confidential. You will have a code number that is known only to the researcher or assistant. The information you give will be stored in a locked cupboard and will be kept for a minimum of seven years. The consent form which you sign to participate in this study will be kept for a minimum of five years. Information from this study may be used for other studies, but again no one will be able to identiy you in the final reports. Should we undertake such studies, we will submit them for ethics review by the Faculty of Nursing, University of Alberta review committee.

Participation in this study is strictly voluntary. Your care while in hospital or after discharge will not be affected in any way by refusing to participate in this study. You can refuse to answer any question in the interview. You can stop the interview or decide not to give another interview, by telling the researcher or calling either of the numbers above.

There may be no direct benefits to you from being in this study. The information that you give may be of benefit to others having heart surgery. Results of the study will be sent to you by mail.

If you would be willing to participate in a long-term follow up of people following cardiac surgery, please answer below.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. Your participation in this research project includes a 15-20 minute interview before your operation, review of your medical record, three 15-20 minute telephone interviews following your operation, and anonymous use of the information you provide for this and possibly other studies. In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time without jeopardizing your health care. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. If you have further questions concerning matters related to this research, please contact:

Kathryn King (403) 467-7509 (call collect)
Foothills Hospital Research Assistant XXX-XXXX

If you have any questions concerning your rights as a possible participant in this research, please contact the Office of Medical Bioethics, Faculty of Medicine, Univestiy of Calgary, at 220-7990.

Participant	Date
Investigator	Date
Witness	Date

I would be willing to be contacted at a later time following my surgery to answer some questions about my recovery.

YES ___/ NO___ (check one)

Informed Consent Form
Holy Cross Hospital

Project Title: Gender Issues in Short-Term Recovery from Cardiac Surgery

Investigator: Kathryn King, RN, MN
PhD Candidate, Faculty of Nursing
University of Alberta
Phone: 492-6836
467-7509 (may call collect)

Supervisor: Janet C. Ross Kerr, RN, PhD
Professor, Faculty of Nursing
University of Alberta
Phone: 492-6253

The purpose of this study is to learn about recovery from heart surgery. A researcher will want to talk with you before your heart surgery and again at one, two, and three months following your surgery. The researcher will also want to review your hospital record to learn about your medical history and some aspects of your hospital stay.

Each interview will last about 15-20 minutes. The first interview will be completed before you have your surgery and will focus on how you feel before surgery. The other interviews will be done over the telephone after you go home and will focus on your recovery. You may be telephoned at a later time to see if you are willing to have some information mailed to your home. You will be asked to read and make comments about the information sent to you. You are free to refuse to do so.

There are some possible risks or discomforts from being in this study. You may find the interview tiring. The interview might bring to the surface some things you might not care to think about. You may stop the interview at any time.

Information from this study may be used for other studies, but only after ethics approval is obtained. Some of your comments may be used in the final report or in talks about the study, but no one will be able to identify you by these comments. Your name and any information that may identify you will be kept confidential. You will have a code number that is known only to the researcher or assistant. The information you give will be stored in a locked cupboard and will be kept for a minimum of seven years. The consent form

which you sign to participate in this study will be kept for a minimum of five years.

Participation in this study is strictly voluntary. Your care while in hospital or after discharge will not be affected in any way by refusing to participate in this study. You can refuse to answer any question in the interview. You can stop the interview or decide not to give another interview, by telling the researcher or calling either of the numbers above. If you have any questions about the study, you may call either of the numbers above.

There may be no direct benefits to you from being in this study. The information that you give may be of benefit to others having heart surgery. If you would like the results of this study, write your name and address in the space provided.

If you would be willing to participate in a long-term follow up of people following cardiac surgery, please answer below.

THIS IS TO CERTIFY THAT I _____,
(Print name here)
agree to participate in the study `Gender Issues in Short-Term Recovery from Cardiac Surgery'. I have been given the chance to read about the study and ask questions. My questions have been answered in a manner that I understand. I am aware that I will receive a copy of this consent form.

DATE _____

SIGNATURE _____
(participant)

SIGNATURE _____
(researcher)

Please send me a copy of the results of the study

Name _____
Address _____
_____
_____

I would be willing to be contacted at a later time following my surgery to answer some questions about my recovery.

YES ___/ NO___ (check one) participate in the study `Gender Issues in Short-Term Recovery from Cardiac Surgery'.

APPENDIX B

Included in this appendix are the:

(i) Modified version of the McMaster Health State Classification System,
(ii) Modified version of the Preoperative Interview Guide,
(iii) Medical Record Audit, and
(iv) Modified version of the Postoperative Interview Guide

Modified Version of the McMaster Health State Classification System*

ATTRIBUTE		DESCRIPTION (Circle the description that fits)
SENSES	1	Able to see, hear and speak normally for age.
	2	Requires equipment to see or hear or speak.
	3	See, hears or speaks with limitations even with equipment.
	4	Blind, deaf or mute.
MOBILITY	1	Able to walk, bend, lift and climb normally for age.
	2	Walks, bends, lifts, and climbs with some limitations but does not require help.
	3	Requires mechanical equipment (such as canes, crutches, braces or wheelchair) to walk or get around independently.
	4	Requires the help of another person to walk or get around and requires mechanical equipment as well.
	5	Unable to control or use arms and legs.
EMOTION	1	Generally happy and free from worry.
	2	Occasionally fretful, angry, irritable, anxious, depressed or sleepless.
	3	Often fretful, angry, irritable, anxious, depressed or sleepless.
	4	Almost always fretful, angry, irritable, anxious, depressed.
	5	Extremely fretful, angry, irritable or depressed usually requiring hospitalization or psychiatric institutional care.
COGNITIVE	1	Recalls time and place normally for age.
	2	Recalls more slowly than others as judged by relatives and/or friends.
	3	Recalls very slowly and usually requires special assistance.
	4	Unable to recall.
SELF-CARE	1	Eats, bathes, dresses and uses the toilet normally for age.
	2	Eats, bathes, dresses or uses the toilet independently with difficulty.
	3	Requires mechanical equipment to eat, bathe, dress or use the toilet independently.
	4	Requires help of another person to eat, bathe, dress or use the toilet.
PAIN	1	Free of pain and discomfort.
	2	Occasional pain or discomfort is relieved by self control of activity or medication, and renders little or no disruption of normal activities (i.e. home, able to work and engaged in most desired activities).
	3	Frequent pain or discomfort is relieved by medication with occasional disruption or limitations of normal activities (i.e. home with more limitations on desired activities).
	4	Frequent pain or discomfort is relieved or helped by medication, and restricts normal activities frequently (i.e. home or hospitalized, and able only to shower, walk around room/ward/home).
	5	Pain or discomfort is unrelieved by regular medications, and severely restricts engaging in any normal activities (i.e. hospitalized/bedridden).

FERTILITY 1 Rate all subjects as 1.

*This measure was modified by Gortner (Gortner, Jaeger, Harr, & Hlatky, 1994) and subsequently by King (for this study) from the original (Feeny, et al., 1992). NOT TO BE COPIED OR USED WITHOUT PERMISSION from Dr. David Feeny, Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario.

Preoperative Interview Questionnaire*

CODE NUMBER _____ **GENDER** ___ (1-female, 2-male)
TODAY'S DATE __/__/__ **AGE** ____

---

1. What has prompted you to have cardiac surgery now?
   _____
   _____
   _____

2. What are your current living arrangements? Are you living ___(1-with spouse) ____(2-with sibling)___(3-with son)___(4-with daughter)___(5-with friend)___(6-with partner) ___(7-alone)

3. Where will you be staying after you leave the hospital?
   ____(1-own home) ____(2-sibling's home) ____(3-offspring's home) ____(4-friend's home) ____(5-motel/hotel) ____(6-other)

4. May we reach you by telephone there? _____ (0-no, 1-yes) Telephone number_____
   Address for mailing : _____
   _____
   _____

5. Who will be the primary person helping you once you are there?___(1-spouse) ____(2-sibling)____(3-son) ____(4-daughter) ____(5-friend) ____ (6-partner) ____(7-other)

6. Does he/she have any health problems? ____ (0-no, 1-yes) His/her age ____
   Please describe _____
   _____

7. Does he/she work? ____ (0-no,1-yes,2-LOA,3-retired,4-long term disability leave)

   ____(1-professional) ____(2-administrative) ____(3-small business) ____(4-clerical) ____(5-skilled) ____(6-unskilled) ____(7-farming) ____(8-homemaker) ____(9-other)

8. Are you currently working? ____(0-no,1-yes,2-LOA,3-retired,4-long term disability leave)

   ____(1-professional) ____(2-administrative) ____(3-small business) ____(4-clerical) ____(5-skilled) ____(6-unskilled) ____(7-farming) ____(8-homemaker) ____(9-other)

9. Following your surgery, will you return to your work described above? ____(0-no, 1-yes)

10. Do you participate in other activities such as ____(1-caretaker for children) ____(2-caretaker for grandchildren) ____(3-volunteer work) ____(4-caring for ill or debilitated spouse/partner/sibling/child) ____(5-other_____)

11. Following your surgery, will you return to these other activities? ____(0-no, 1-yes)

12. What is the highest level of education that you have completed?

6th grade	___(1)
9th grade	___(2)
11th grade	___(3)
High school graduate	___(4)
Partial postsecondary education	___(5)
Postsecondary graduate	___(6)
Graduate school degree	___(7)

13. Are any of the following among your expectations for recovery?

Prolong life _____ (0-no, 1-yes) Resume activities ___ (0-no, 1-yes)

Improve life quality ___ (0-no, 1-yes) Travel/recreation ___ (0-no, 1-yes)

14. Are there other benefits/goals that you expect from your surgery? Please state.

_____

_____

15. On a scale of zero to ten, how would you rate your quality of life at this time?

0 1 2 3 4 5 6 7 8 9 10

16. On the same scale, how satisfied are you with your life at this time?

0 1 2 3 4 5 6 7 8 9 10

17. On the same scale, to what degree do you plan to recover your health?

0 1 2 3 4 5 6 7 8 9 10

18. New York Heart Association Classification (Patient Report)
This question is about symptoms of your heart problem. Are you...(circle one)

Class 1:	Without Symptoms
Class 2:	Comfortable at rest but with symptoms with ordinary activity
Class 3:	Comfortable at rest but with symptoms with less than ordinary activity
Class 4:	Unable to carry on any physical activity without discomfort. Symptoms may be present at rest

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Medical Record Audit

Dates: __/__/__/ __/__/__/ __/__/__
Admission Surgery Discharge
Admission Diagnosis: _____
Age: _____
Race: _____ (1-white, 2-black, 3-hispanic, 4-asian, 5-other)

Redo ___ (0-no, 1-yes)
Date of previous surgery __/__/__
vessels previously bypassed ___
Valve previously replaced/repaired _____

Admission Symptoms (0-no, 1-yes)
Angina ___
Syncope ___
PND ___
Shortness of breath ___
Fatigue/weakness ___

Medical History (0-no, 1-yes)
Congestive heart failure ___
Peripheral edema ___
Artheritis ___
Cataracts ___
Cancer ___
Other _____(indicate)

previous MI ___
previous PTCA ___

Risk Factors (0-no, 1-yes)
Hypertension ___
Diabetes mellitus ___
High cholesterol ___
Family history of CAD ___
Smoking ___ (1-never, 2-stopped over 1 mo. ago, 3-stopped within 1 mo., 4-smokes now)

NYHA Classification ___
Height _____ (cm)
Weight _____ (kg)

Myocardial Function
Ejection fraction ___%
LV function _____
Cardiac output ____(l)
Cardiac index _____

Extent of Vessel Disease (0-no, 1-yes)
Left main ≥70% ___
LAD ≥70% ___
Circumflex ≥70% ___
Right Coronary Artery ≥70% ___
Angioplast attempt? ___

Type of Surgery ___
1-CABG
2-Single Valve
3-Double Valve
4-CABG and Single Valve
5-Septal Repair
6-Triple Valve

Conduits Used ___
1-n/a
2-internal mammary
3-saphenous
4-both

Complications (0-no, 1-yes)
Stroke ___
Transmural MI ___
Nontransmural MI ___
Deep sternal infection ___
Bleeding requiring reoperation ___
Return to OR for 2nd CP bypass ___
Heart block: perm. pacemeker ___
Sepsis or endocarditis ___
GI bleed, perforation, infarction ___
Renal failure requiring dialysis ___
Cardiac arrest in PAR, ICU, ward ___
Non-routine mechanical support following ___

Cardiac Rehabilitation Referral
____ (0-no, 1-yes)

Medications	Admission	Discharge	Dosage	Frequency

Number of days in ICU ___

Number of days in stepdown (ward) care ___

Discharged alive? ___ (0-no, 1-yes)

Died in ___
1-operating room
2-ICU
3-stepdown (ward) care

Discharged to ___
1-own home
2-sibling's home
3-offspring's home
4-friend's home
5-other

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Postoperative Self Report of Recovery Questionnaire*

CODE NUMBER _____ **TODAY'S DATE** __/__/__
ADMINISTRATION __/__/__
1 2 3

NO REPORT ___ (1-withdraw voluntarily, 2-unable to locate, 3-postoperative complications)
If 3, describe_____
_____

ACTIVITIES/SOCIAL ROLES

1. Have you returned to your normal activity? ____ (0-no, 1-yes)

2. If you were working before surgery (see preoperative interview), have you returned to work? ___(0-no, 1-yes)

3. What has permitted you/prevented you from returning to work?
_____
_____

4. Have you returned to your other activities (see preoperative interview guide for individual responses to this question)? ___ (0-no, 1-yes)

5. What has permitted you/prevented you from returning to these other activities?
_____
_____

6. Have you participated in a formal cardiac rehabilitation program? ___ (0-no, 1-yes)

7. If no, why not?
_____
_____

RISK FACTORS

8. What is your current smoking status? ___ (0) non-smoker
___ (1) pipe smoker
___ (2) cigar smoker
___ (3) cigarette smoker

9. Number of packs per day ___ (0) not applicable, (1) 1 pack/day, (2) 2 packs/day
(3) 3 or more packs/day

MEDICATIONS

10. List cardiac medications, including nitrates, diuretics, HRT.

Name	Dosage	Frequency

DISCOMFORTS OR SYMPTOMS

11. Do you have anginal discomfort? ___ (0-no, 1-yes)

12. If yes, as compared to before surgery, is this ___(2-more), ___(1-less), or ___(0-no change)

Do you have discomfort related to:

13. Chest incision? ___ (0-no, 1-yes)
    Describe _____

14. Leg incision? ___ (0-no, 1-yes, 9-no incision)
    Describe _____

15. Back? ___(0-no, 1-yes)
    Describe _____

16. Neck? ___(0-no, 1-yes)
    Describe _____

17. Do you have swelling in your hands or feet first thing in the morning? ___ (0-no, 1-yes)

18. Do you have shortness of breath? ___ (0-no, 1-yes)

19. If yes, does it occur -- at rest? ___ (0-no, 1-yes)
20. --with exertion? ___ (0-no, 1-yes)
21. --awakens me at night? ___ (0-no, 1-yes)
22. --first thing in the morning? ___ (0-no, 1-yes)

23. If yes, (to question 18) as compared to before surgery, is this ___(2-more)___(1-less) ___(0-no change)

24. Are there any other discomforts or symptoms since your surgery?
    _____

HEALTH CARE UTILIZATION/VISITS (since last call)

25. Have you been for a regularly scheduled check-up? ___ (0-no, 1-yes)

26. Have you visited a doctor because of new problem? ___ (0-no, 1-yes)

27. What kind of problem? _____
_____

28. What kind of physician? _____

29. How many visits? _____

30. Have you been rehospitalized? ___ (0-no, 1-yes)

31. How many times? ___

32. For what reason? _____

33. Have you used: home health aides (1) ___
home care nurses (2) ___
none (0) ___

SUPPORT SYSTEMS

34. Who has been your primary source of emotional support since you have been discharged?
___(1) spouse___(2) son___(3) daughter___(4) sibling___(5)friend
___(6)partner___(7) other _____

35. Who has been most helpful to you since you have been discharged?
___(1) spouse___(2) son___(3) daughter___(4) sibling___(5)friend
___(6)partner___(7) other _____

36. Why has this person been helpful?
_____
_____

NYHA CLASSIFICATION (Circle one)

Class 1: No Symptoms
Class 2: Comfortable at rest but with symptoms with ordinary activity
Class 3: Comfortable at rest but with symptoms with less than ordinary activity
Class 4: Inability to carry on any physical activity without discomfort. Symptoms may be present at rest

HEALTH STATE

37. To what degree do you believe you have recovered your health as of this date?

0 1 2 3 4 5 6 7 8 9 10

38. Can you explain?_____

_____

QUALITY OF LIFE

39. How would you rate your quality of life as of this date?

0 1 2 3 4 5 6 7 8 9 10

40. Can you explain?_____

_____

LIFE SATISFACTION

41. How satisfied are you with your quality of life?

0 1 2 3 4 5 6 7 8 9 10

42. Can you explain? _____

_____

REALIZED BENEFITS (at three months only)

Which of the following benefits were among those you had expected from your surgery and now have realized?

43. Prolonged life? _____(0-no, 1-yes)
44. Freedom from pain and fatigue? _____ (0-no, 1-yes)
45. Improved quality of life? _____ (0-no, 1-yes)
46. Return to former activities? _____ (0-no, 1-yes)
47. Travel and recreation? _____ (0-no, 1-yes)
48. Personal goal stated before surgery? _____ (0-no, 1-yes)

_____

49. If you were to consider having surgery again, would you choose it? ____ (0-no, 1-yes)
Narrative:

50. Are you satisfied with your decision to have surgery? ___ (0-no, 1-yes)
Narrative:

51. What was particularly helpful/not helpful to you in your recovery from cardiac surgery?
Narrative:

52. What advice or recommendations would you give to other women/men to assist them in their recovery from cardiac surgery?
Narrative:

53. Is there anything else that you would like to share with me about having cardiac surgery that might help me understand your experience?
Narrative:

54. FOR WOMEN ONLY: Sometimes women who have larger breasts have different sensations in their chest incisions. To see if this is so for the women in this study, would you be willing to tell me your brassier size? Size:_____

55. Would you be willing to share with me your annual household income? Is it...

<$30,000/yr	___
$30,000-$45,000/yr	___
>$45,000-$60,000/yr	___
>$60,000--$75,000/yr	___
>$75,000	___

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APPENDIX C

Preoperative Questionnaire.

Question 1. What has prompted you to have cardiac surgery now?

Reasons for Having Surgery Now	% (number)
Length of Symptoms:	% (n/47)
Sudden onset	17% (8)
≤6 months	17% (8)
>6 months, ≤12 months	15% (7)
>12 months, ≤2 years	13% (6)
>2 years, ≤5 years	21% (10)
>5 years, ≤10 years	6% (3)
>10 years	11% (5)
Waiting:	% (n/63)
Urgent inpatient	51% (32)
≤3 months	22% (14)
>3 months, ≤6 months	6% (4)
>6 months, ≤12 months	17% (11)
>12 months	3% (2)
Motivators:	% (n/93)
Doctor's Advice	23% (21)
Fear/Concern	11% (10)
No other option; other treatments ineffective	19% (18)
Increasing Limitations	47% (44)

Question 6. Please describe the health problem (if any) of the expected primary caregiver.

Identified Health Problem of Expected Caregivers	% n/46	Identified Health Problem of Expected Caregivers	% n/46
musculoskeletal	37% (17)	GI	4% (2)
cardiovascular	35% (16)	diabetes	4% (2)
debilitative chronic illness	9% (4)	renal/GU	2% (1)
other diagnosis	9% (4)	former cancer patient	2% (1)
current cancer patient	4% (2)	mental health patient	2% (1)

Postoperative Questionnaire

Question 3. What has permitted you/prevented you from returning to work?

Reason*	1 mos postop % (n/35)	2 mos postop % (n/36)	3 mos postop % (n/30)
too soon	100% (35)	69% (25)	40% (12)
should see doctor first	17% (6)	0%	10% (3)
has been advised not to	14% (5)	6% (2)	10% (3)
feeling well enough	6% (2)	17% (6)	33% (10)
most days, but need extra rest	6% (2)	0%	7% (2)
there, but limits activities	0%	8% (3)	3% (1)

*occasionally, more than one reason given

Question 5. What has permitted/prevented you from returning to these `other activities'?

Reason*	1 mos postop % (n/45)	2 mos postop % (n/38)	3 mos postop % (n/36)
too soon	93% (42)	61% (23)	42% (15)
gradually increasing, but need extra rest	7% (3)	16% (6)	28% (10)
should see doctor first	4% (2)	5% (2)	8% (3)
too cold/poor weather	0%	8% (3)	3% (1)
feeling well enough	0%	16% (6)	17% (6)
decided to wait	0%	0%	3% (1)

*occasionally, more than one reason given

Question 7. If you have not attended cardiac rehabilitation, why?

Reason*	1 mos postop % (n/91)	2 mos postop % (n/78)	3 mos postop % (n/76)
not referred	19% (17)	19% (15)	14% (11)
too soon	18% (16)	5% (4)	3% (2)
on waiting list	18% (16)	23% (18)	16% (12)
see doctor first for referral	15% (14)	8% (6)	4% (3)
not available	14% (13)	24% (19)	30% (23)
not interested	11% (10)	10% (8)	14% (11)
doctor said no	4% (4)	8% (6)	16% (12)
not accessible (too difficult to get to...)	3% (3)	4% (3)	4% (3)
have been before	3% (2)	4% (3)	3% (2)
too ill	2% (2)	3% (2)	1% (1)

*some people had more than one reason

Question 13b. Describe your chest incision discomfort.

Problems with Chest Incision*	1 mos postop % (n/72)	2 mos postop % (n/48)	3 mos postop % (n/54)
sore, aches	69% (50)	96% (46)	70% (38)
infection	10% (7)	2% (1)	2% (1)
numb, sensitive	8% (6)	31% (15)	15% (8)
stiff, pulls	6% (4)	17% (8)	7% (4)
with moderate or sudden movement	6% (4)	17% (8)	11% (6)
with inactivity	4% (3)	0%	4% (2)
draining	4% (3)	0%	2% (1)
when fatigued	4% (3)	0%	0%
with any movement	3% (2)	0%	2% (1)
with strenuous/prolonged movement	1% (1)	8% (4)	7% (4)
lump at end	0%	4% (2)	7% (4)
swelling	0%	0%	2% (1)

*some responded with more than one problem

Question 14b. Describe your leg incision discomfort.

Problems with Leg Incision*	1 mos postop % (n/48)	2 mos postop % (n/39)	3 mos postop % (n/32)
sore, aches	58% (28)	59% (23)	53% (17)
draining	29% (14)	15% (6)	6% (2)
infection	23% (11)	10% (4)	6% (2)
swelling	15% (7)	18% (7)	9% (3)
numb, sensitive	8% (4)	10% (4)	9% (3)
stiff, pulls	2% (1)	13% (5)	9% (3)
with any movement	2% (1)	0%	0%
with inactivity	2% (1)	0%	6% (2)
lump at end	2% (1)	3% (1)	0%

*some responded with more than one answer

Question 15b. Describe your back discomfort.

Problem with Back Pain*	1 mos postop % (n/44)	2 mos postop % (n/36)	3 mos postop % (n/26)
sore, aches	86% (38)	81% (29)	69% (18)
with inactivity	23% (10)	14% (5)	15% (4)
one side only	9% (4)	11% (4)	19% (5)
bilaterally	9% (4)	0%	0%
stuff, pulls	7% (3)	11% (4)	4% (1)
with moderate or sudden movement	2% (1)	0%	0%
with any movement	0%	0%	4% (1)
with strenuous or prolonged movement	0%	6% (2)	0%
numbness, tingling	0%	0%	4% (1)

*some had more than one problem related to back pain

Question 16b. Describe your neck discomfort.

Problem with Neck Pain*	1 mos postop % (n/37)	2 mos postop % (n/26)	3 mos postop % (n/20)
sore, aches	68% (25)	77% (20)	55% (11)
with inactivity	24% (9)	15% (4)	20% (4)
stuff, pulls	14% (5)	8% (2)	5% (1)
one side only	11% (4)	4% (1)	10% (2)
numbness, tingling	5% (2)	0%	5% (1)
with moderate or sudden movement	5% (2)	8% (2)	5% (1)
bilaterally	3% (1)	0%	5% (1)
with strenuous or prolonged movement	3% (1)	0%	0%
with fatigue	0%	4% (1)	0%

*some had more than one problem related to neck pain

Question 24. Are there any other discomforts or symptoms since your surgery? (Not accounted for in questions 27 and 32)

New Problem Since Surgery*	1 mos postop % (n/13)	2 mos postop % (n/14)	3 mos postop % (n/13)
difficulty sleeping	31% (4)	14% (2)	23% (3)
persistent cough/sore throat/voice problems	23% (3)	21% (3)	0%
arm/hand mobility/soreness/control	15% (2)	14% (2)	8% (1)
headaches	8% (1)	7% (1)	0%
SOB	8% (1)	7% (1)	23% (3)
GI problems	8% (1)	0%	0%
ringing in ears	8% (1)	7% (1)	8% (1)
depression	0%	14% (2)	23% (3)
balance problems	0%	7% (1)	0%
palpitations	0%	7% (1)	15% (2)
joint pain	0%	14% (2)	0%
vision problems	0%	7% (1)	15% (2)
memory loss	0%	29% (4)	0%

*some had more than one problem

Question 27. What was the new problem for which you visited a doctor?

New Problem Requiring Physician Consultation*	1 month postop % (n/39)	2 months postop % (n/32)	3 months postop % (n/22)
infection--chest	18% (7)	9% (3)	9% (2)
infection-leg	18% (7)	6% (2)	5% (1)
respiratory-related to surgery	15% (6)	19% (6)	5% (1)
renal/GU	13% (5)	0%	0%
medication tolerance	10% (4)	3% (1)	5% (1)
GI	8% (3)	6% (2)	5% (1)
respiratory-unrelated to surgery	8% (3)	9% (3)	9% (2)

New Problem Requiring Physician Consultation* (cont'd)	1 month postop % (n/39)	2 months postop % (n/32)	3 months postop % (n/22)
circulatory problems	8% (3)	13% (4)	9% (2)
musculoskeletal	8% (3)	3% (1)	14% (3)
neurological	5% (2)	6% (2)	9% (2)
arrhythmia	5% (2)	16% (5)	5% (1)
chest incision soreness	3% (1)	3% (1)	0%
nosebleeds	3% (1)	0%	0%
chest pain/angina	3% (1)	9% (3)	18% (4)
depression	0%	3% (1)	0%
rash, skin irritation	0%	6% (2)	0%
sepsis	0%	3% (1)	5% (1)
anemia	0%	0%	5% (1)
accidental burn	0%	0%	5% (1)
throat--swallowing	0%	0%	0%

*some had more than one problem

Question 32. Why were you rehospitalized?

Stated Reasons for Rehospitalization*	1 mos postop % (n/16)	2 mos postop % (n/10)	3 mos postop % (n/4)
respiratory-related to surgery	44% (7)	10% (1)	0%
GI	25% (4)	10% (1)	0%
medication intolerance	25% (4)	0%	0%
infection--chest	25% (4)	30% (3)	25% (1)
renal/GU	15% (2)	20% (2)	25% (1)
arrhythmia	15% (2)	10% (3)	0%
infection-leg	6% (1)	20% (2)	0%
circulatory problems	6% (1)	0%	25% (1)
rash, skin irritation	6% (1)	0%	0%
chest pain/angina	0%	10% (1)	0%

Stated Reasons for Rehospitalization (cont'd)	1 mos postop % (n/16)	2 mos postop % (n/10)	3 mos postop % (n/4)
depression	0%	10% (1)	0%
sepsis	0%	20% (2)	25% (1)

*some had more than one reason

Question 36. Why has this person been helpful?

Why was he/she most helpful?*	1 mos postop % (n/97)	2 mos postop % (n/106)	3 mos postop % (n/115)
supportive	56% (54)	62% (66)	68% (78)
`helpful'	37% (36)	32% (34)	28% (32)
takes care of me (emotionally)	37% (36)	31% (33)	24% (28)
helps with MY work	21% (20)	22% (23)	26% (30)
does his/her work--which I appreciate	7% (7)	7% (7)	4% (5)
takes care of me (physically)	5% (5)	5% (5)	3% (4)
self-reliant	3% (3)	4% (4)	3% (4)

*some had more than one response

Question 38. Can you explain (perceived recovery score)?

Reasons for Perceived Recovery Score*	1 mos postop % (n/98)	2 mos postop % (n/109)	3 mos postop % (n/118)
improving	58% (57)	75% (73)	63% (74)
symptoms from other diseases remain	31% (30)	25% (27)	25% (30)
not doing usual activities	23% (23)	14% (15)	7% (8)
feeling great, normal	19% (19)	28% (30)	30% (35)
returning to some work around home, housework	8% (8)	17% (19)	23% (27)
release from pain, worry	7% (7)	8% (9)	4% (5)
unhappy, disappointed	4% (4)	2% (2)	4% (5)
not as good as before surgery	3% (3)	1% (1)	2% (2)

Reasons for Perceived Recovery Score* (cont'd)	1 mos postop % (n/98)	2 mos postop % (n/109)	3 mos postop % (n/118)
generally happy, pleased	2% (2)	3% (3)	3% (3)
retuning to employment, other activity	0%	1% (1)	3% (4)
possible return of cardiac symptoms	0%	3% (3)	4% (5)
some extraneous event	0%	0%	1% (1)

*some had more than one response

Question 40. Can you explain (perceived life quality score)?

Reasons for Perceived Life Quality Score*	1 mos postop % (n/96)	2 mos postop % (n/107)	3 mos postop % (n/65)
improving	36% (35)	49% (52)	72% (47)
not doing usual activities	31% (30)	17% (18)	23% (15)
feels great, good	20% (19)	36% (38)	58% (38)
support/help	19% (18)	11% (12)	42% (27)
symptoms from other diseases remain	14% (13)	11% (12)	12% (8)
generally happy	14% (13)	13% (14)	40% (26)
unhappy, disappointed	9% (9)	6% (6)	17% (11)
release from pain, worry	5% (5)	8% (9)	9% (6)
not as good as before surgery	2% (2)	2% (2)	0%
some extraneous event	2% (2)	2% (2)	5% (3)
returning to work around home, housework	2% (2)	1% (1)	3% (2)
possible return of cardiac symptoms	1% (1)	2% (2)	6% (4)
financial worries	0%	1% (1)	3% (2)
has financial security	0%	0%	1% (1)
returning to employment, other activity	0%	6% (6)	6% (4)
weather effects	0%	2% (2)	5% (3)

*some responded with more than one reason

Question 42. Can you explain (perceived life satisfaction score)?

Reasons for Perceived Life Satisfaction Score*	1 mos postop % (n/91)	2 mos postop % (n/103)	3 mos postop % (n/105)
generally happy	51% (46)	53% (55)	71% (75)
not doing usual activities	26% (24)	19% (20)	7% (7)
feels great, good	23% (21)	25% (26)	22% (23)
improving	16% (15)	24% (25)	21% (22)
unhappy	12% (11)	8% (8)	14% (15)
support/help	10% (9)	13% (13)	12% (13)
symptoms from other diseases remain	10% (9)	7% (7)	9% (9)
finding life perspective	7% (6)	6% (6)	10% (10)
release from pain, worry	5% (5)	5% (5)	3% (3)
not as good as before surgery	1% (1)	2% (2)	1% (1)
possible return of cardiac symptoms	0%	1% (1)	3% (3)
financial worries	0%	4% (4)	1% (1)
has financial security	0%	0%	1% (1)
some extraneous event	0%	1% (1)	3% (3)

*some had more than one reason

Additional Questions Asked at Three Months Postoperatively

Question 49. If you were to consider having surgery again, would you choose it?

Reason*	% (n/110)
only if absolutely necessary	39% (43)
outcome has been very good this time...	25% (28)
feel rejuvenated	8% (9)
under conditions where I thought it would be successful	7% (8)
wouldn't want to do it again	6% (7)
likely too old	5% (5)
have a lot of living to do	5% (5)
worry, symptoms, pain, now gone	4% (4)
still recovering from difficulties postoperatively	3% (3)
wish it could have been done earlier	2% (2)
hate hospitals	2% (2)
just the best option at the time	1% (1)

*some gave more than one reason

Question 50. Are you satisfied with your decision to have surgery?

Reason*	% (n/104)
no choice	37% (38)
things were so bad, now feel much better	31% (32)
things turned out so well	28% (29)
a bit ambivalent	5% (5)
waiting was the hardest, should have been done sooner	4% (4)
health personnel were so helpful	3% (3)
family/social network so helpful	1% (1)
not satisfied	1% (1)
not as bad as I thought it would be	1% (1)

*some gave more than one reason

Question 51. What was particularly helpful/not helpful to you in your recovery from cardiac surgery?

Responses*	% (n/94)	Responses*	% (n/94)
cardiac rehab	43% (17/40)	released from care too early	3% (3)
family/friends	37% (35)	PT, OT, Speech therapists	2% (2)
homecare nurses	23% (16/69)	pain medication	2% (2)
health care staff generally	10% (9)	being a smoker--not helpful	2% (2)
physicians	9% (8)	never really thought about it	2% (2)
hospital nurses	7% (7)	found things to occupy my mind	2% (2)
bad weather--a problem	5% (5)	getting out	2% (2)
good attitude	5% (5)	nurse phone calls	2% (2)
good care received	4% (4)	nontraditional therapy	1% (1)
not knowing	4% (4)	talked with others who had this	1% (1)
took control	4% (4)	God	1% (1)
knowing I'm ok now	3% (3)	knowing I didn't need to go back to work	1% (1)

*some gave more than one reason

Question 52. What advice or recommendations would you give to others to assist them in their recovery from cardiac surgery?

Recommendations*	% (n/102)
have a good attitude	29% (29)
help yourself--get moving/active after	27% (28)
listen to health care people--do what you're told	25% (26)
have it done, encourage them	21% (21)
recognize limits--don't overdo	15% (15)
go to cardiac rehab	9% (9)
don't give up, or get discouraged	8% (8)
have a good support network	8% (8)
don't be afraid	6% (6)
get lots of information, ask questions	4% (4)
find something to occupy yourself	4% (4)
you'll have peace of mind when it's done	3% (3)
there will be lots of help, accept it and have confidence	3% (3)
ask God	3% (3)
talk with other heart patients	3% (3)
be as healthy as you can to start	1% (1)
take painkillers	1% (1)
wear a good bra	6% (3/52)

*some gave more than one response

APPENDIX D

Preoperative Measures: Correlation Matrices for Gender and Age Groups

Men

	age	educ	income	NYHA	BMI	QOL	satisfy	soc.sup	functn
educ	-.265 p=.041								
income	NS	NS							
NYHA	NS	NS	NS						
BMI	NS	NS	NS	NS					
QOL	NS	NS	NS	NS	NS				
satisfy	NS	NS	NS	NS	NS	.582 p<.001			
soc.sup	NS	NS	NS	NS	NS	NS	NS		
functn	NS	NS	NS	NS	NS	NS	NS	NS	
health state	NS	NS	NS	-.668 p<.001	NS	.365 p<.004	NS	NS	NS

Women

	age	educ	income	NYHA	BMI	QOL	satisfy	soc.sup	functn
educ	-.389 p=010								
income	NS	NS							
NYHA	NS	NS	NS						
BMI	NS	NS	NS	NS					
QOL	NS	-.334 p=.010	-.339 p=.009	-.304 p=.020	NS				
satisfy	.296 p=.023	NS	NS	-.301 p=.022	NS	.569 p<.001			
soc.sup	NS	NS	NS	NS	NS	NS	NS		
functn	NS	NS	NS	-.436 p=.001	NS	.455 p<.001	.354 p=.006	NS	
health state	NS	NS	NS	-.634 p<.001	NS	NS	NS	NS	NS

Subjects Less Than 65 Years of Age

	age	educ	income	NYHA	BMI	QOL	satisfy	soc.sup	functn
educ	-.327 p=011								
income	NS	NS							
NYHA	NS	NS	NS						
BMI	NS	NS	NS	NS					
QOL	NS	NS	-.266 p=.040	NS	NS				
satisfy	NS	NS	NS	-.270 p=.037	NS	.502 p<.001			
soc.sup	NS	NS	NS	NS	NS	NS	NS		
functn	NS	NS	NS	-.423 p=.001	NS	.272 p=.035	.344 p=.007	NS	
health state	NS	NS	NS	-.642 p<.001	NS	.319 p=.013	NS	NS	.328 p=.010

Subjects 65 Years of Age and Older

	age	educ	income	NYHA	BMI	QOL	satisfy	soc.sup	functn
educ	NS								
income	NS	NS							
NYHA	NS	NS	NS						
BMI	NS	-.045 p=.001	-.280 p=.040	NS					
QOL	NS	NS	NS	-.349 p=.007	NS				
satisfy	.258 p=.05	NS	NS	-.285 p=.032	NS	.624 p<.001			
soc.sup	NS	NS	NS	NS	NS	NS	NS		
functn	NS	NS	NS	NS	NS	.429 p=.001	NS	NS	
health state	NS	NS	NS	-.648 p<.001	NS	NS	NS	NS	NS

APPENDIX E

One Month Postoperative Measures: Correlation Matrices for Gender and Age Groups

Men

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	-.351 p=.009	NS			
recov	NS	NS	NS	NS	NS	NS		
QOL	-.388 p=.012	NS	NS	NS	NS	NS	..491 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	.634 p<.001	.673 p<.001

Women

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	NS	NS			
recov	NS	NS	.313 p=.032	NS	NS	NS		
QOL	NS	NS	NS	NS	NS	NS	.692 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	.681 p<.001	.744 p<.001

Subjects Less Than 65 Years of Age

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	-.304 p=.032	NS			
recov	NS	NS	NS	NS	NS	NS		
QOL	NS	NS	NS	NS	-.315 p=.029	-.306 p=.031	.457 p=001	
satisfy	NS	NS	NS	NS	-.316 p=.030	NS	.673 p<.001	.579 p<.001

Subjects 65 Years of Age and Older

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	.286 p=.044	NS	NS	NS	NS			
recov	NS	NS	NS	NS	NS	NS		
QOL	NS	NS	NS	NS	NS	NS	.720 p<.001	
satisfy	-.284 p=.042	.322 p=.016	NS	NS	NS	NS	.653 p<.001	.820 p<.001

APPENDIX F

Two Month Postoperative Measures: Correlation Matrices for Gender and Age Groups

Men

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	NS	NS			
recov	NS	NS	NS	NS	NS	NS		
QOL	NS	NS	NS	NS	NS	NS	.635 p<.001	
satisfy	NS	NS	.261 p=.048	NS	NS	NS	.642 p<.001	.866 p<.001

Women

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	NS	NS			
recov	NS	NS	NS	NS	NS	-.455 p=.001		
QOL	NS	NS	NS	NS	NS	NS	.818 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	.574 p<.001	.650 p<.001

Subjects Less Than 65 Years of Age

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	NS	NS			
recov	NS	NS	NS	NS	NS	-.502 p<.001		
QOL	NS	NS	NS	NS	NS	-.390 p=.004	.813 p=001	
satisfy	NS	NS	.299 p=.029	NS	NS	-.439 p=.001	.789 p<.001	.899 p<.001

Subjects 65 Years of Age and Older

	age	soc.sup	functn	health state	LOS	NYHA	recov	QOL
soc.sup	NS							
functn	NS	NS						
health state	NS	NS	NS					
LOS	NS	NS	NS	NS				
NYHA	NS	NS	NS	NS	NS			
recov	NS	.262 p=.047	.268 p=.042	NS	NS	NS		
QOL	NS	NS	NS	NS	NS	NS	.646 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	.415 p<.001	.568 p<.001

APPENDIX G

Three Month Postoperative Measures: Correlation Matrices for Gender and Age Groups

Men

	age	income	soc.sup 1	soc.sup 2	functn 1	functn 2	hlth st 1	hlth st 2	NYHA	recov	QOL
educ	-.265 p=.041										
income	NS										
soc.sup 1	NS	NS									
soc.sup 2	-.288 p=.026	NS	.591 p<.001								
functn1	NS	NS	NS	NS							
functn 2	NS	.260 p=.045	NS	NS	.293 p=.023						
hlth st 1	NS	NS	NS	NS	NS	NS					
hlth st 2	NS	NS	NS	.280 p=.031	NS	.396 p=.002	.423 p=.001				
NYHA	NS	-.287 p=.026	NS	NS	NS	-.303 p=.019	NS	NS			
recov	NS	NS	.309 p=.016	NS	NS	.479 p<.001	.276 p=.033	.495 p<.001	-.379 p=.003		
QOL	NS	NS	NS	NS	.308 p=.017	.354 p=.006	.286 p=.027	.297 p=.021	NS	.601 p<.001	
satisfy	NS	NS	NS	NS	NS	.363 p=.005	.343 p=.005	.264 p=.044	-.271 p=.038	.573 p<.001	.766 p<.001

Women

	age	educ	income	soc.sup 1	soc.sup 2	functn 1	functn 2	hlth st 1	hlth st 2	NYHA	recov	QOL
educ	-.329 p=.010											
income	NS	NS										
soc.sup 1	NS	NS	NS									
soc.sup 2	-.410 p=.001	-.316 p=.014	.334 p=.009	.498 p<.001								
functn1	NS	NS	NS	NS	NS							
functn 2	-.352 p=.006	.323 p=.012	.275 p=.033	NS	.267 p=.039	NS						
hlth st 1	NS	NS	NS	NS	NS	NS	NS					
hlth st 2	NS	NS	.273 p=.033	NS	.222 p=.015	NS	.407 p=.001	NS				
NYHA	NS	NS	NS	NS	NS	NS	NS	NS	NS			
recov	NS	NS	NS	.198 p=.030	NS	NS	.330 p=.010	NS	.607 p<.001	-.515 p<.001		
QOL	NS	NS	NS	NS	NS	NS	.356 p=.005	NS	.641 p<.001	-.404 p=.001	.833 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	.373 p=.003	NS	.710 p<.001	-.284 p=.028	.769 p<.001	.869 p<.001

Subjects Less than 65 Years of Age

	age	educ	income	soc.sup 1	soc.sup 2	functn 1	functn 2	hlth st 1	hlth st 2	NYHA	recov	QOL
educ	-.327 p=.011											
income	NS	NS										
soc.sup 1	NS	NS	NS									
soc.sup 2	-.261 p=.044	-.258 p=.047	.443 p<.001	.464 p<.001								
functn1	NS	NS	NS	NS	NS							
functn 2	NS	NS	.297 p=.021	NS	.257 p=.048	NS						
hlth st 1	NS	NS	NS	NS	NS	.328 p=.010	NS					
hlth st 2	NS	NS	.414 p=.001	NS	.357 p=.005	NS	.433 p=.001	NS				
NYHA	NS	NS	NS	NS	NS	NS	NS	NS	-.377 p=.003			
recov	NS	NS	NS	.198 p=.030	NS	NS	.436 p<.001	NS	.512 p<.001	-.616 p<.001		
QOL	NS	NS	NS	NS	.358 p=.005	.352 p=.006	.520 p<.001	NS	.596 p<.001	-.538 p=.001	.809 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	.491 p<.001	NS	.612 p<.001	-.435 p=.028	.713 p<.001	.836 p<.001

Subjects 65 Years of Age and Older

	age	educ	income	soc.sup 1	soc.sup 2	functn 1	functn 2	hlth st 1	hlth st 2	NYHA	recov	QOL
educ	NS											
income	NS	NS										
soc.sup 1	NS	NS	NS									
soc.sup 2	-.262 p=.043	NS	NS	.689 p<.001								
functn1	NS	NS	NS	NS	-.274 p=.034							
functn 2	-.386 p=.002	NS	NS	NS	NS	.346 p=.007						
hlth st 1	NS	NS	NS	NS	NS	NS	NS					
hlth st 2	NS	NS	NS	NS	NS	NS	.385 p=.002	.281 p=.030				
NYHA	NS	NS	NS	NS	.272 p=.035	NS	-.276 p=.033	NS	NS			
recov	NS	NS	NS	.272 p=.035	NS	NS	.384 p=.002	NS	.601 p<.001	-.271 p=.036		
QOL	NS	NS	NS	NS	NS	NS	NS	NS	.342 p=.007	NS	.539 p<.001	
satisfy	NS	NS	NS	NS	NS	NS	.273 p=.037	NS	.421 p=.001	NS	.647 p<.001	.800 p<.001